ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE, TELEGRAPH AND SCIENTIFIC PROGRESS.

(Formerly Review of Telegraph and Telephone.)

Vol. 7, No. 15. WEEKLY. NEW YORK, SATURDAY, DECEMBER 12, 1885. $3 per annum. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

The Thomas Cut-Out for Incandescent Lighting.

We present our readers in this issue illustrations of the Thomas patent cut-out for incandescent lighting on arc-light circuits, and diagram showing method of connecting the same. This valuable invention is for sale by the Electrical Supply Company, 175 Lake street, Chicago, and, since its introduction, has met with much favor from the electric lighting companies. To give our readers an excellent idea of he work expected from the cut-out, we publish herewith the directions as given by the inventor. The cut-out is firmly secured to the ceiling by screws. Connect the main line of the arc circuit, connecting the positive wire to the binding post marked 1; connect the other main line to binding post 2 from the opposite side of the cut-out.

Run the loop lines one from each of the binding posts 3 and 4, taking in an equal number of incandescent lamps on each side, connecting one side of each lamp to the leading wire running from the binding posts, and the other side of the lamp another wire running to and connecting with the negative main-line wire running from binding post 2. These loops may be made in any form desired, running some of the lamps to one part of the building and some to others, but always keeping the number of lamps on the two branches equal.

Set a suitable switch at some convenient place where it can be readily operated, connecting it with wires same size as line wire, one side of switch to connect with the positive main-line wire at the binding post 1 on cut-out, and the other side to the negative main-line wire at binding post 2 on cut-out.

After the cut-out is set up and connected with the lamps as above, open the switch in main line, and, if the lamps all start up properly, then remove the brass cover from the case enclosing the magnet coil, and turn the hard rubber plug to the right until all the lights are extinguished, then close the switch. Now turn the hard rubber plug back to the left about one-half turn, now open the switch, and, if the lamps don't start, just tap the plug slightly with a knife or key; when the lamps have started again, again close the switch and remove one lamp from the loop, and when upon opening the switch again the other lamps should not start up, but, in case they do, then turn the plug very slightly to the right until they are extinguished; now replace the lamp in the loop again. After the cut-out is once properly adjusted, it will need no further attention.

Never allow the plug to be removed from the magnet head, because it confines mercury in a little cup in which the armature floats, and, should the mercury become spilled out, the cut-out will not operate. In case, from any cause, the mercury should become spilled, procure one and three-quarter ounce of pure mercury and put into the cup, and be sure that the iron float which is in the cup floats with the cupped or concave side up, when the cut-out is standing upon the table; then replace the plug, so that the wire pin in it will enter the hole in the center of the float, and screw it down carefully.

Incandescent lamps of suitable ampere measurement to just take an even number of lamps to equal the ampere of current of the arc lamps in use on the line; this is essential, inasmuch as the cut-out is constructed to carry, in its normal operations, the same number of lamps on each branch, and, when the resistance in the loop is thrown out of balance by reason of one or more lamps giving out, then the cut-out comes into action and shunts the current through the main line.

An Electric Battery Used in Exploding the Cartridge of a Dynamite Gun.

There was a miniature Flood Rock explosion in the outer harbor of New York, Saturday. No harm was done, but the party on the steamer John E. Moore, who had gone down to see the first trial of the pneumatic dynamite gun, invented partly by Lieutenant Zalinski, the good dynamiter, were somewhat disturbed to see a large cartridge which they knew to contain a hundred pounds of dynamite, whiz over their heads and explode in the bay about 200 yards away. Lieutenant Zalinski was detailed some time ago by the Government to experiment on dynamite as a means of warfare. Mention of his success has been frequent, and with the aid of Captain Candy he has succeeded at last in perfecting a missile whose explosive power is sufficient to penetrate or crack the heaviest armor. At Fort Lafayette, where the experiments were being made, a cast-iron tube extended about fifty feet into the air at an angle of 45°. Four cylindrical air reservoirs were underneath this tube, and connected with it by iron pipes. On the ground beside it was the cartridge. The cartridge consists first of a conical projectile weighing about a hundred pounds, through whose center has been bored a small cylindrical groove. In this groove are two electric batteries, one wet and one dry, and it is to the latter that much of the success of the work may be attributed, an account of which appeared in the REVIEW a few weeks ago. From these batteries a little platinum wire runs into the next part of the cartridge, a brass cylinder containing a hundred pounds of dynamite. Behind the dynamite is a heavy log of wood—in the tail of the cartridge. By a neat invention of Lieutenant Zalinski, whenever the projectile strikes after its discharge from the pneumatic gun, the shock jars the batteries, the platinum wire becomes incandescent in the midst of the dynamite, and an enemy's man-of-war goes below to see what struck her. The cartridge is fired necessarily from a pneumatic gun, since powder guns discharge the dynamite immediately by the excessive shock of the explosion.

Two blank cartridges were fired first for range on this occasion. They fell over two miles from the fort. The range, as they thought, being ascertained, the party boarded the steamer and sailed down the harbor somewhat over a mile to get a nearer view of the explosion. The signal was waved and the projectile shot up into the air. The cartridge struck about 200 yards from the visitors' boat, and in one second there was another loud report and the water shot up about 200 feet in the air. The experiment was a success. Lieutenant Zalinski was heartily congratulated. Electricity in his skillful hands had scored another triumph.

FIG 1.—THOMAS CUT-OUT FOR INCANDESCENT LIGHTING ON ARC CIRCUITS.—ELECTRICAL SUPPLY COMPANY.

Automatic Fire Extinguishers.

Last week a trial was made in a building behind the Queen's Theater at Poplar, of the Victor Automatic Fire Extinguisher and Alarm, an apparatus of the kind known in America as automatic sprinklers. The experiment took place in a stable with a tiled roof supported on wooden rafters. On the floor there was placed a large heap of straw, covered with tow and saturated with paraffin. This was lighted and in a few seconds it caught fire all over, the hot blaze completely filling the building, and licking out in tongues of fire between the tiles of the roof. For some seconds this continued until the sprinklers came into action, when the flame was suddenly checked and replaced by steam and smoke, the fire dying down to a smouldering mass in a few minutes. An inspection, after the smoke had cleared away, showed that the interior of the stable was filled with a rain of a pitiless drenching character, the drops being very small and exceedingly close together, so that their wetting action was great and perfectly uniform. In descending through the flame this shower abstracted the heat from the gases so rapidly that they could no longer enter into combustion with the oxygen, while at the same time the abundant steam which was generated also tended to choke the combustion. The mass of straw was completely sodden, while a moment's stay in the building recalled one of those wet days which occur every few years, when the streets are deserted, umbrellas and overcoats being useless to withstand the steady down-pour. We have at various times devoted considerable space to apparatus of this class, and need not describe it at length. That now being introduced into this country consists of a main water pipe of suitable diameter (say 1 in. or 1½ in.) laid along the under side of the roof or ceiling of the building to be protected. At every 10 ft. there is a valve opening into a branch, from which there projects four pipes, each 5 ft. long and perforated on the upper side with holes. This valve has a flat lead seat, and a long spindle which projects downwards through a guide into the open air. At the point where it emerges it is soldered to the guide by a fusible composition, which melts at a temperature of 165 deg. to 170 deg. Fahr., and consequently as soon as the metal attains this temperature, the solder gives way, the valve falls, and the water rushes into the perforated pipes. By these it is distributed over the entire surface of the ceiling, from which it rebounds in rain, as already explained. From an investigation made by Mr. C. J. H. Woodbury, of Boston, for the Factory Mutual Insurance Companies of New England, and already published by us, it appears that during the last seven years sprinklers have worked at 131 mill fires in America without a single known failure, and that they remain in good working order without any attention. They are now being introduced into London by Mr. E. S. Cartman, of 64 Cannon Street, E. C., and should make rapid progress. In no part of the country are fires so destructive as in London, the water supply is often deficient, the height of the buildings is very great, and the streets in many places are so narrow that the Brigade cannot find positions of advantage from which to attack the flames. Under these circumstances an appliance which brings a long record of successes from America should meet with ready acceptance.—*London Engineering.*

—— "The electric light of Ottumwa, Ia.," says a writer from that city, "is one of the most successful ventures our citizens have engaged in, and the light furnished is superior to that of any of the other cities around us. I asked a business man, who is interested in the plant, if he wished to dispose of his stock, and received a ready negative reply. There are over sixty lights in use among the stores and hotels of the city, and for each light a revenue of ten dollars is yielded. The expense will not far exceed one half of the amount of the revenue derived, and it does not require a knock-down argument to convince one that there's a profit in it. This plant can be extended at will, the business go on increasing, and as the city grows, unless something more attractive springs up, a perfect bonanza is quite certain to result for the original investors."

Miles of Telegraph Wires that Stretch from the New York Battery to Yonkers —The Code of Signals that the Police Use.

One end of an underground cable, swathed in lead and packed in asphalt, was run through a hole in the basement wall of the Police Headquarters building in Mulberry Street, a week or two ago, and into the department telegraph office. The other end is fastened at Fire Hall, half a dozen blocks away, where the 900 miles of fire alarm wires start and end. Very soon the wires that are strung on poles between these two points will be dispensed with and the city's first underground cable will be in working order. Of the thousands of telegraph lines that envelop the city as in the meshes of a huge net, none can claim half the importance of these two. By the even temporary obstruction of either, or both, the city might be exposed to the gravest of dangers. In times of trouble its fate hangs on them as on no other single resource; hence when mobs have threatened New York, the struggle from first to last has centered about the fire and police telegraph lines, especially the latter, as the point to possess. How large a share the police telegraph itself has borne in the final triumph of law and order is shown in the vote of thanks to Superintendent Crowley and his men, passed after the draft riots by the Common Council in public acknowledgment of the debt the city owed them. Alike in much, the two systems differ radically. The Fire Department wires are for fire business only. With the exception that they are used in calling ambulances when they are wanted and the firemen are handy, they have no other work to do. With the police wire the case is different. Beside the ever-changing phases of police business with which they deal, the accidents, the crimes, the thousand and one every-day emergencies of a big city, they have to repeat the fire alarms as they come in as a warning to the police at the nearest station; to transact all the varied business of the election bureau six weeks in the year; carry messages for the Department of Public Works to and from all parts of the city night and day, and stand around handy for the Health Department when wanted, which is pretty much all the time. In summer the offal contractor fairly monopolizes them with the dead-cat problem; and he no sooner lets up than Chief O'Brien puts an embargo on them with orders to his army of 4,000 election inspectors, poll clerks and other employes. After the "first Tuesday after the first Monday" in November, the harassed operators enjoy a spell of comparative leisure, if no special emergency turns up to disturb it. The police wires reach from the Battery, where the steamer *Patrol* lies waiting for news of trouble on the river, to Yonkers. The latter is made to serve as a sort of outpost for the New York Police Department, a very wise arrangement, as experience has shown when thieves take the north-bound track in their efforts to get away. Horse thieves especially patronize that route. In the summer, when fighting excursions go up from the lower wards to the groves on the Hudson, it comes handy, too, when the Patrol is not around. The wires cross the East river on the big bridge and put Brooklyn headquarters in communication with the Central Office in Mulberry Street, and a submarine cable reaches Staten Island, which was once embraced in the metropolitan police system. The five circuits, independent of each other, that embrace all of the thirty-four precinct stations in the city, take in as well the principal banks and safe-deposit companies, the Sub-Treasury and Assay Office, the public hospitals and the institutions on Blackwell's and Ward's Islands, which are all by this means placed in instant communication with the police in case of need. Their gongs, alarm bells, telephones and dials, and apparatus of divers kinds for transmitting and receiving calls, make the telegraph office in the basement of the Mulberry Street marble building a queer place to look at, and a bad one for nervous people to tarry in. All day they keep three trained operators on their mettle; and from sundown till midnight two who take their places at roll-call have enough to do minding them. One can generally manage the morning watch from midnight till breakfast time. But there are times when this force proves totally inadequate and the precinct roundsmen who are handiest about the dial have to be pressed into service; for the telegraph work takes precedence of all other cares or concerns in the department. In a large measure they all depend on it.

EXCELLENT HOSPITAL SERVICE.

Our ambulance service, which has served as model for all the systems in use in Europe that amount to anything, owes to it its excellence. All calls for ambulances, whether sent over the Fire Department wires or from a precinct, are transmitted to the nearest hospital from headquarters. Lately an important addition has been made to the machinery of the ambulance service through the enlisting of the private telegraph lines of the four elevated railroads. If an accident occurs at any point in the city that happens to be nearer or more convenient to an elevated railroad station than to a police station, a hospital, or an engine house, all the policeman has to do is to fill in a printed card which he carries for the purpose, with the location where the ambulance is wanted, and his own name, and send it by the first messenger to the nearest elevated station. The operator transmits it without delay, to either the Houston or Bleecker street station; whence it is telephoned to headquarters and passed on to the hospital. This plan has proven of great practical value. It was the outcome of negotiations opened a year or two ago by Superintendent Crowley with the elevated railroad people, who entered into the plan very readily and have since done everything to make it a success. In this ambulance business the handier, but less reliable, telephone has commenced to crowd the old-fashioned telegraph dial, but in all matters pertaining to department work, the telegraph holds its place. The fact is, that the New York Police Department does too much business to use the telephone to advantage, unless it had its own system and central station, and even then it is probable that its work would be hindered or altogether obstructed in the lower part of the city by the mass of telegraph wires that cross the path of the police lines. The dial system is simple enough. It is rarely necessary for the operator to spell out the message at length, except in the case of general orders or alarms. A code of signals by combinations of figures enables them to carry on the ordinary run of police business expeditiously and with much greater certainty of avoiding misunderstanding than the telephone would guarantee. Thus the figure 4 stands for Yes; 7 for No; 82 for "Hurry up." "Have you a lost boy? translated in police telegraph lingo spells 374. The figure 896, that is wrung daily many times, calls for "a coroner forthwith." The call 2424 summons an ambulance, 2426 the dead-wagon, and 2434 the sick-wagon. Whether or not there is some hidden sarcasm in thus putting the dead-wagon ahead where the police come in, is a matter of conjecture. The traditional extra rib accounts, perhaps, for the fact that in the telegraphic language of the police department 2437 stands for woman, while 2436 does for the man.

"It is a large fire," is the rendering of the signal 2835, and 2842 means "Fire is out." The signal 952 never fails to make a stir over the way, where the newspaper offices are, for it means, "Send the reporters to this station," and wherever it comes from it never waits long for the desired response. Between headquarters and St. Vincent's Hospital a special code of signals is in use, that is distinguished for a certain professional brevity that almost smacks of cynicism. The "hurry signal," 142, for instance, is translated in the key, "An ambulance and bring stomach-pump." Brief as it is, it is enough, though, and tells the doctor what he wants to know, that somebody has been poisoned and needs to be pumped out. Another code is in use up in the annexed district, where the mounted police have signal-boxes on their long and lonely beats by means of which they can communicate with the distant station, record themselves as being on duty, summon assistance, or give warning of a fire. These boxes are exceedingly useful institutions. A plan to supply the entire city with alarm-boxes on a similar plan, that were to serve as spies on the patrolmen by compelling them to "pull" them at stated intervals, stranded not long ago on the snag of too great cost. The expense of fitting them up was found to exceed a quarter of a million of dollars, and the project was dropped. It was gotten up by a private company and did not meet with favor in the department. The company's boxes were put up in the Fifteenth precinct, west of Broadway, between Houston and Fourteenth streets, and there they remain, but they are not in use.

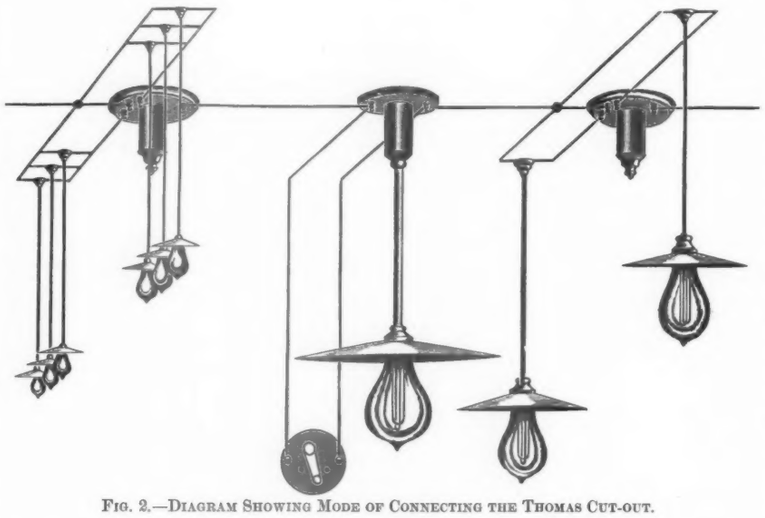

FIG. 2.—DIAGRAM SHOWING MODE OF CONNECTING THE THOMAS CUT-OUT.

ELECTION RETURNS—THE DRAFT RIOTS.

Since the elevated railroads revolutionized the manner of transmitting the returns from the precinct stations to headquarters, election night is no longer the busiest of the year in the police telegraph office. Mounted men wait at the Bleecker and Houston street stations and carry the returns over to Mulberry street at a gallop, as fast as they are brought down by special messengers. Now the hot days in summer when men and beasts drop in their tracks, give the operators most to do. At such times more than one-half of the messages that pass over the wires are to the offal dock, giving notice of dead horses, cats and dogs in the streets. The daily average of messages, long and short, exceeds probably three hundred, of which from twenty-five to fifty are destined to the reporters, conveying brief outlines of accidents, murders and crimes of all sorts.

There are others not meant for them which they try hard to waylay by judicious skirmishing, sometimes sucessfully and sometimes not. According to the degree of success, there is joy or the gnashing of teeth in one or the other of the warring newspaper camps in Mulberry street, for these secret messages nearly always furnish valuable clews to good "cases," which the police are trying to keep from the press until they have got the start in the hunt for the offenders. In a stuffy old vault behind the operator's room lie piles upon piles of blotters, in whose musty pages the bloody record of the three days of draft riots in the summer of 1863 is set down in the terse official language, but with a graphic simplicity which no historian's pen has yet equaled. The story is part of the honorable record of the office of which it is justly proud. It opens on the morning of July 13, with warning of trouble brewing at the draft office at No. 1,190 Broadway, and calls for the unemployed reserves of other precincts. The laborers are suspending work all over the city, says another dispatch, and gathering with crowbars and other weapons in threatening crowds. By noon the threats had become earnest, and Superintendent Crowley reports the telegraph poles down from Forty-sixth to Fifty-seventh streets on the West side, and fires burning in the Twenty-ninth precinct and half a dozen other quarters. The mob is preventing the firemen from getting at them As fast as the telegraph poles are felled, they are put up again, wherever practicable, only to be attacked again by the rioters. Calls for the Aldermen to meet to consider the emergency stand side by side with orders to the force in Brooklyn and New York to turn out to a man. Superintendent Kennedy is reported injured in the fight, and the *Tribune* office attacked. Lawlessness and desolation are spreading in proportion as the field of the telegraph is rapidly narrowing, as the poles are chopped down. Before night it has grown alarmingly small. In the disheartened messages from east and west, sometimes suddenly cut off and left unfinished, one can almost see, twenty years after, the lurid light of the scores of fires that lit up the city all through that long night of terror that closed in upon the first day of mob rule in New York. The few gleams of hope and courage that brighten the day's record are multiplied before nightfall on the 14th. The militia has come upon the scene, and the police clubs have begun to tell. They have been laid on unsparingly and a citizen, evidently afraid that they may give out, telegraphs an offer of 500 clubs to the Police Board. It is received with avidity. This and that captain sends word briefly, "We licked them," and others take heart. They have need of it. Calls for help are invariably answered: "None to send; have all we can do to settle with our own mob." Few show the white feather. One frightened sergeant reports from the Eighteenth precinct that the mob is coming, 4,500 strong, and that he must leave, for they "carry guns." Never-ending calls for the coroner fill the old blotter of this date and for days afterward. The tramp of the battle-scarred veterans from the field and the ominous rumble of heavy artillery echo from them on the morning of the 16th, and order is restored. The precincts report: "All quiet."—*New York Mail and Express.*

* * Criticising the recent experiments of M. Marcel Deprez, M. Hospitalier says that the more he examines the results submitted to the Academie des Sciences on the 26th ultimo, the less he is able to understand the enthusiasm which they have called forth.

The Tatham Dynamometer.

The Tatham dynamometer, constructed for the Franklin Institute last year, which measured the power consumed by the dynamo-electrical machines tested by a committee of judges in June last, is capable of measuring 100 horse-power. The largest machine then measured required 70 horse-power; the smallest .23 horse-power. Concerning this dynamometer the inventor gives us the following:

It occupies a floor space of about 6 feet by 4 feet, and is about 7½ feet high. The cast iron bed-plate rests upon heavy castors and is provided with leveling screws Upon

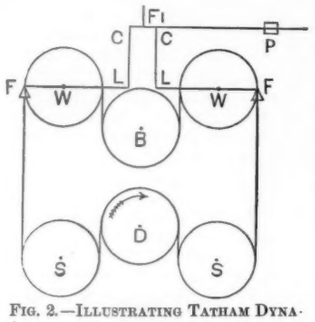

FIG. 2.—ILLUSTRATING TATHAM DYNAMOMETER.

this bed-plate are erected the two main frames, bolted together at convenient places and united at the top by a cast iron arch, from which the scale beam is suspended. A movable **A**-frame in two parts is hinged to the bed-plate, and when in position, holds firmly the journal boxes of the outside bearings of the two middle shafts. When opened, it gives liberty to change the outside pulleys, or the belts which run upon them. This dynamometer is upon the same principle as the small machine, but differs from it, in that the single pulley upon the first motion shaft of the small machine is replaced by three pulleys in the large one.

(Reference being had to the skeleton sketch herewith) the reasons for this change were:

(1.) To reduce the height of the machine.

(2.) To give the journals of the pulley shaft *D* a fixed position, while the two outside lower pulleys are used to tighten the belt.

(3.) To make the two pulley *B* and *D* run in the same direction and with the same speed.

All of the pulleys are cast iron plate pulleys, turned all over inside and out and accurately balanced. They are twelve and a-half inches face and are upon cast steel shafts, two inches diameter, running in brass boxes, which are from six to eight inches in length.

The pulley *D* is twenty-five inches diameter, crowned and placed upon the first motion shaft, which receives power from an outside belt. The pulley *B*, twenty-five inches diameter, ground perfectly true and flat, is upon a shaft which conveys the power to the machine to be tested. In measuring a motor, its power is applied to the pulley *B*.

The two pulleys *S* and *S* are crowned, twenty-one inches diameter, and their shafts run in bearings which are upon vertical slides regulated by screws. The vertical movement of these pulleys regulates the tension of the belt. The pulleys *W* and *W* are twenty-one inches diameter, slightly crowned, and their shafts run in bearings upon the two lever frames *L F* and *L F*, each of which has its fulcrum in a pair of knife edges at *F*, resting upon the main frame. The inside ends of the lever frames are suspended by links *L C* and *L C* to the scale beam *F P* at equal distances on either side of the principal center of the beam. There are two adjustments to each of these lever frames. (1.) Two micrometer screws adjust the position of the center of the pulley, so that the line of effect of a belt hung on it on the outside will pass through the fulcrum, and no addition of weight to the belt will affect the scale beam; which is experimentally proved. (2.) The position of the knife-edge suspended to the link is adjusted so that the scale beam weighs accurately any weight suspended by a piece of belt hung over the inside of the pulley.

The endless belt used was a four-ply gum belt 12 inches wide and .26 inches thick. The breaking strain was 12,000 pounds. It was originally intended to use a three-ply belt, .21 inches thick, and the pulley *B* was constructed so that the effective diameter would be 25.21 inches, giving a delivery of belt of 6.6 feet per revolution. The arrows indicate the movements of the belt.

It will be seen by the construction, that the pulley *B* is actuated by the difference of the tensions of the two parts of the belt tangent to it, and that the scale beam weighs the same difference of tensions of the same parts tangent to the pulleys *W* and *W*.

As the accuracy of weighing was the vital requisite, the construction of the dynamometer was intrusted to the celebrated scale makers, Messrs. Fairbanks & Co. The scale beam was graduated by Messrs. Brown & Sharpe in 600 divisions of $\frac{1}{16}$ inch each representing a half-pound with the traveling poise used. On this poise is a small beam

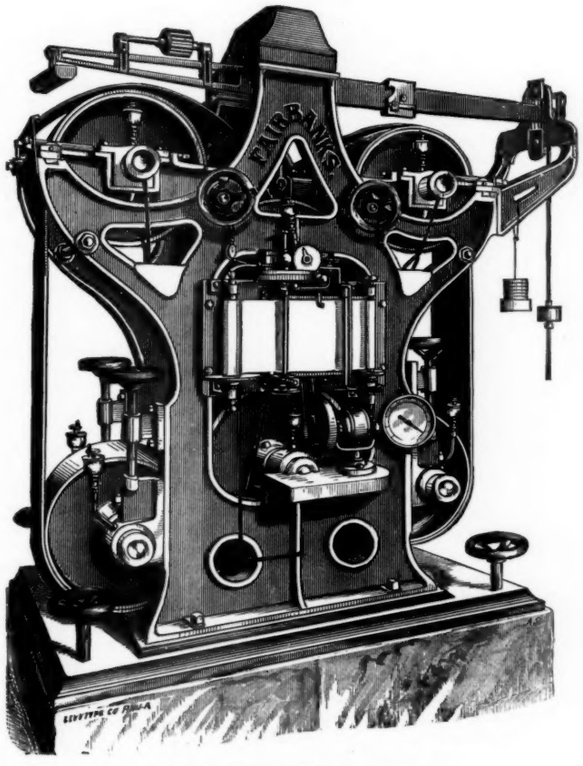

FIG. 1.—TATHAM DYNAMOMETER.

graduated in hundredths, so that the small poise upon the small beam is capable of weighing $\frac{1}{160}$ of a pound when the machine is in motion. The more rapid the motion the more delicately can the weighing be accomplished.

In testing dynamo-electrical machines, the resistance measured being very uniform, it was only necessary that the belts used should be of even thickness and free from lumpy splicings, to get rid altogether of the tendency to dance, which otherwise afflicts the beams of belt dynamometers.

The fastest speed made by the dynamometers in June last was 1,700 revolutions per minute, which gave the belt a speed of two and one-eighth miles per minute, or about one-eighth the velocity of a rifle ball. The fastest speed of any test was about 1,400 revolutions (9,240 feet of belt) per minute continued for ten consecutive hours, during which the belt ran over 1,000 miles.

The centrifugal force tending to break the belt at this speed, is about 1,350 pounds on each part, but this force does not come on the journals or pulleys; it is confined to the belt itself, and stretches it until it becomes slack. The slack is taken us by screwing down the pulley *S*, or *S*, and when the machine slows or stops the belt *is* tight.

In getting the "friction" of the pulley *B*, after a test, the machine was run light at the same speed that it had run loaded during the test; thus comprehending in similar measure all sources of resistance whether from friction proper, bending and straightening the belt, or air currents. The force required to bend and straighten the belt was sensibly affected by the temperature of the air.

Before the dynamo tests began, it was observed that the air currents, caused by the rapid movement of the belt, interfered with the functions of the scale beam, and it was found necessary to place sheet iron roofs over the upper pulleys. The lubrication is accomplished by an automatic feed, under control.

The machine is provided with a counter, which registers the number of revolutions up to 1,000,000. The number of revolutions per minute can be observed to within a fraction of one revolution.

It is also provided with apparatus to record the power measured. This, however, was not used during the tests, as direct weighing was found so convenient, and the results could be so quickly calculated. At the end of the scale beam is a vertical rod attached below to an iron cylinder, which floats in mercury in an iron cylindrical pipe.

The beam being balanced, any force tending to raise it, lifts the cylinder out of the mercury proportionally. This motion, multiplied by levers, is communicated to a pencil point, which moves vertically one-eighth of an inch to the pound, and records the weight upon a paper band moving horizontally one inch for every 100 revolutions, and recording them. This automatic registration of weight is applied only to the fractions of weight between the even fifty pounds, the principal part of the weight being hung at the end of the scale beam in the usual way.

By confining the registration to this small excess, it is registered on the large scale above mentioned. The calculation of horse-power measured is very simple. Multiply the number of revolutions by the weight (in one-half-pound) on the scale and divide by 10,000. The result is horse-power and decimals. This, however, supposes a belt twenty-one hundredths of an inch thick. A thicker belt requires a correction in accurate work.

Not the least interesting portion of the report of the committee referred to, is that relating to the "Calibration of the Dynamometer." In order to prove whether or not the dynamometer measured correctly the power transmitted through it, it was used in the determination of the mechanical equivalent of heat on an enormous scale. The water churn used was a cylinder 3 feet diameter and 3 feet long, holding 1,223 pounds of water. In the continuous method, devised by Professor Marks, the water entered the churn at nearly uniform temperature and left it at nearly uniform temperature, about 15.5° Centigrade higher than it entered. The operation continued for three hours. The first half-hour was occupied in bringing the exit water to uniform temperature, when the experiment proper began and continued for two hours and a-half, during which over five tons of water passed through the churn and was raised about 15.5° Centigrade by the continued exertion of about forty-six horse-power.

The result as calculated was:

Mechanical equivalent for 1° Centl..1391.05 foot lbs
Mechanical equivalent for 1° Fahr.. 772.81 foot lbs.

Dr. Joule's last determination was 772.55 foot pounds, and Prof. Rowland's is higher.

It was Charged with Electricity.

A dispatch from Boston, Mass., says: G. W. Norris, a piano dealer, occupies an iron front building at 604 Washington street. Last evening, during the rain storm, an electric-light wire became detached from its fastening in the roof, and, coming in contact with the iron, the entire front of the building was soon heavily charged with electricity. Several persons experienced slight shocks on touching anything metallic about the building, and three persons who leaned against a brass railing which extends across the store window were curiously affected.

Mr. Alma E. Norris, a son of the proprietor, who placed both hands on the bar, near the end next the iron door post, in addition to being violently hurled into the street—half-way across, one person said—had his face, which did not touch any metal, painfully though not seriously burned.

Frank McNish, the acrobat, of McNish, Johnson & Slavin's Minstrels, paused to scan the glittering display in the store window. He took hold of the little brass rail and got a frightful shock. For the next two minutes he tackled that rail with all the vim of a wrestler working for a lock. He went over it and under it, and clung to it like a brother, with a series of contortions that set all his previous performances of "silence and fun" completely in the shade. Luckily, he was not silent, however, and Patrolman McKnight, on hearing his vehement remarks, came to the rescue, being obliged to pull him off by main strength. As he was freed from the bar, he shot backward almost as though propelled from a catapult, and landed in the street, as Mr. Norris had done.

The bar was regarded with great curiosity by a number of persons who had collected, awaiting, doubtless, another victim. He soon came in the person of William G. Lash, of 257 Shawmut avenue. Mr. Lash got a very serious shock, being rendered insensible, and requiring the aid of a police ambulance to reach his home, where, at last accounts, he is recovering, and will undoubtedly escape serious injury. Patrolman Knight then mounted guard over that rail, and was pretty busy keeping people away from it until word was sent to the Brush Company's headquarters and a lineman cut the wire from the circuit.

.... The Postal Telegraph and Cable Company, No. 3, has been chartered at the State Department at Harrisburg, Pa., to do a general telegraph business. The line begins at Carbondale and runs through Lackawanna, Luzerne, Columbia, Montour, Northumberland and Dauphin Counties to Harrisburg. The capital is $5,000, and the incorporators are Williamson Howell, Charles C. Adams, William M. Mullen, Charles H. Snyder, of Philadelphia; Edward C. Platt, of New York, and David B. Davidson, of Brooklyn.

Electrical Review.

Published at 23 Park Row.

P. O BOX 3329.

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SUBSCRIPTION.

United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.

Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.

Transient, 25 cents per line, nonpareil.

EDITORIAL ANNOUNCEMENT.

Address all communications and make all checks and P. O. orders payable to order of ELECTRICAL REVIEW P. O. Box 3329, New York

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, DECEMBER 12, 1885.

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Suit has been brought by the American Bell Telephone Company against the Globe Telephone Company, and also against Mr. Meucci personally. As Meucci is over 80 years of age, the defendants are anxious to preserve his testimony, and have asked that it be taken at once, and this is now being done.

The telephone is now recognized as an important factor in life saving work on the coast. A recent wreck of the schooner *Mattie E Tabor*, on the bar near Point Pleasant, N. J., was well handled by the aid of the telephone in causing co-operation of the life-saving forces, and all on board were safely landed.

We are in receipt of an inquiry from Minneapolis, asking for information concerning the longest arc circuit in operation. We should be pleased to hear from our electric-light friends who are familiar with the work of these long circuits. At Lynchburg, Va., there is a circuit twenty one miles long, four dynamos being connected in series, supplying fifty arc lamps of 1,000 candle-power. This is claimed to be the longest in the world.

In a recent decision Judge Wallace, of the U. S. Circuit Court, held that the fifth claim of the second Bell patent was invalid, on the grounds that it was old. On Monday, after a half-hour's argument by Mr. J. J. Storrow, attorney of the Bell Company, Judge Wallace was convinced of his mistake, and now declares in favor of the entire patent. The claim in question has special reference to the magnet used.

Monday was a satisfactory court day for the American Bell Telephone Company. Besides the decision in the case at Syracuse, given in full in another column, Judge Wallace granted two decrees in favor of the Bell Company, both on final hearing, and the cases will now go direct to the U. S. Supreme Court. One of the opposing companies was the People's Telephone and Telegraph Company, owning the Hopkins patents, and the other the Overland Company, owning the Baxter patents.

It was the intention of the officials of the Interior Department, who sat in the great telephone case, to meet and hold a conference last Saturday, upon the briefs which have been submitted by the counsel representing the various companies. Owing, however, to the indisposition of Secretary Lamar, the conference was not held. Mr. Lamar was not at the Department Monday morning, and it is thought that the conference will be postponed until the latter part of the week. The impression seems to be that the Attorney-General will be advised to institute suit to test the validity of the Bell patent.

The Morrison gravity battery, manufactured by the Southern Electric Company, of Baltimore is securing an enviable reputation in the class of closed-circuit batteries. One of the strongest endorsements any battery ever received is the one given this by the Gamewell Fire Alarm Telegraph Company. This company state that they have adopted it as their standard battery, and pronounce it the best form of gravity-battery their experience of thirty years has met with. The inventor of the battery is Mr. J. F. Morrison, well known to the electrical fraternity and President of the National Electric Light Association.

The number of new names continually being received at the headquarters of the National Electric Light Association in Baltimore is a true indication of the interest that this new and vigorous organization is receiving at the hands of the electrical public; and that the application for membership is endorsed by some one who is already a member, and is accompanied with the admission fee, are strong proofs of the excellent work the present members are doing and show the good faith of the new comers. We venture the prediction unhesitatingly, that the next meeting, which occurs in the middle of February, at Baltimore, will be the largest and most enthusiastic gathering of electrical people that ever came together.

The application of the Baltimore and Ohio Telegraph Company for a mandamus to compel the Delaware and Atlantic Telegraph Company to place a telephone in its office at Wilmington, Del., was refused, last Saturday, by the Superior Court. The application came up at a preceding term, when it was argued at length. In dismissing the case the court does not enter at all into the merits of the application, but bases its dismissal solely upon the ground that the applicant is a foreign corporation, and as such has no standing in a Delaware court. "Supposing for the mere sake of argument," continues the opinion, "that a foreign corporation can have any existence or capacity in this State, how can it be claimed that the plaintiff in this case has any such standing, seeing that its operations are expressly confined to the territorial limits of Maryland?" To admit the plaintiff's claim, the court holds, would be to render a dead letter that provision of the State Constitution which requires the vote of two-thirds of each branch of the Legislature to pass a corporate act.

AN ELECTRIC RAILWAY IN PHILADELPHIA.

The electric railway on Ridge Avenue, Philadelphia, was tried last Saturday and proves to be a complete success. The car was run over the entire road several times, at a rate of speed equal to seven miles an hour, and from beginning to end of the public test, all worked well and smoothly. We congratulate the officers of the Ridge Avenue Passenger Railway Company upon the intelligence they have shown: 1st, in adopting electricity as a motor; and 2d, in selecting a field for it which it has fully proven its ability to occupy with merit.

We believe that the day is not far distant when electricity will prove a dangerous rival to steam on all branch lines of railroad; but that time is not yet come, and it is manifestly absurd for electricians, however enthusiastic, to expect more of the electro-motor than it is yet equal to.

The Philadelphia company, on the other hand, first learned what the electro-motor, in its present condition of development, could readily do, and wisely confined themselves to expecting this much and nothing more. As a result, they have established an electric railroad that will prove at once a boon to their patrons because of its effectiveness, and a prize to its owner because of its economy.

ELECTRICITY ON A NAVAL CRAFT.

The launch of the naval boat, *Eureka*, at Poillon's ship-yard, in Brooklyn, last week, was an event which may fairly be chronicled under the head of Electric News, for if this boat proves a success, as her constructor, Mr. Secor, predicts, it will be in great measure owing to the use of electricity. The power which is to propel this unique naval construction is derived from a series of gaseous explosions; and while the principle has been understood for many years a commercial value could not be hoped for until the recent improvement was made in the dynamo-electric machine. The *Eureka* is characterized by the local press as an "electric boat," but this characterization is misleading. Never having heard of a boat of this kind before, we scarcely can think of a fitting name and one which will in a single word express its character. But where, as in this case, electricity is used only for setting a motive power free, the whole construction could not justly take its name from the current itself.

But, nevertheless, electricity is the factor which has made the adoption of the principle practicable, and to electricity, therefore, must be attributed whatever of success may be attained by it.

The projectors say they will be able by means of the new principle to double the time now made on the ocean by the swiftest steamers; and while we cannot say we believe they will do anything like this, we wish them every success, and trust that electricity will effectually aid them in attaining it, as it has helped many another.

THE ABSORPTION OF LIGHT BY FOGS.

Prof. J. Gryllis Adams has recently delivered a lecture before the British Association, in which he brings forth some facts in relation to this very important subject, which are quite at variance with preconceived notions. In his experiments upon the effect of dense fogs in eclipsing light from various sources, the conditions were quite nearly simulated by admitting steam at several points into the large photometric gallery, 380 feet in length, at the South Foreland lighthouse. At one end of the gallery was placed a ring gas-burner of 2,500 candles, and a De Meritens arc lamp, giving a light of about 12,000 candles, and when daylight was completely shut out no light from the sources penetrated the fog to a distance of over 100 feet. "From 90 to 100 feet," says Prof. Adams, "when the electric light was exposed there was just the faintest possible illumination of the fog in the general direction of the source of light, but when the gas was exposed not the slightest illumination could be seen. On approaching nearer the illumination from the electric light became brighter, but when that was eclipsed there was no illumination whatever from the gas until a point 65 feet from the source of light was reached. From 60 to 65 feet there was just a faint illumination of the fog from the gas-light.

"An interesting experiment was made with the electric light of 12,000 candles and the standard single candle in the steam fog. It was found that the glowing carbons were seen to a distance of 80 feet, and the single standard candle was seen to a distance of 40 feet. Again, in another experiment the glowing carbons were seen to a distance of 117 feet, and the standard candle to a distance of 80 feet. A single gas jet in this steam fog was seen to a distance of 70 feet, that is, within 10 feet of the light of 2,500 candles, showing that the distances to which a light is seen in fog depends upon the intrinsic brightness of the flame, and that an increase in the size adds very little to the penetrative power." Prof. Adams has tabulated his results, which illustrate very clearly the law of absorption, and obtains a certain co-efficiency of absorption, 0.9537 per foot, that is, that portion of the light from the source extending a foot from it. To these cases of absorption the law of diminution inversely as the square of the distance, as is shown, does not apply.

A very important point in these experiments is the character of the illumination noted, for instance, whenever the electric-light was exposed the illumination of the fog was white, but gas gave it a yellow or orange-yellow tinge; this seemed to show that in a steam cloud in air without the mixture of other substances the rays of different colors were absorbed and scattered in very nearly the same proportions. In relation to this point, Sir William Thomson made some remarks that would seem to indicate a difference in the character of inland fogs, especially those in large cities and manufacturing towns, and the fogs of the coast; and stated that the fogs of London, Glasgow, and perhaps Manchester, had a very peculiar character—they made all lights red at a very short distance. Again along the Thames embankment he had seen the electric-lights so obscured that a half or quarter of a mile distant they could scarcely be discerned from the gas-lights. Prof. Adams used a pocket spectroscope in his experiments, and obtained the rain bands in the yellow near the sodium lines, and other rain bands in other parts of the spectrum showing that the true selective absorption of the molecules of water vapor was not specially confined to the blue end of the spectrum.

In summarizing the results of his observations at the South Foreland he speaks as follows: "If we take lights of the two kinds, gas and oil, of equal intensity, the electric lights in thick weather will give the mariner 30 times the light, and in clear weather 40 times the light given from the other sources. With regard to the question of the absorbing power of the atmosphere in different kinds of weather for different lighthouse lights, the principles I have attempted to explain as to the greater absorption of the atmosphere of the blue rays than of the red, and the fact that the electric light, while abounding in all, is especially rich in red, would lead us to expect that the illumination from the electric light will be weakened somewhat more than that from other sources in foggy weather. Although this does not appear from the steam fogs, yet the other measurements made at the South Foreland show a somewhat greater weakening of the electric beam."

These are facts to ponder, for indeed they point most conclusively to the efficacy of the electric light, in warning the mariner in foggy weather, over gas or oil as a source of lighthouse illumination.

However, there are many problems yet requiring solution in connection with the practical working of isolated plants by unskilled labor, and, perhaps, far away from fresh water supply; yet they do not appear insurmountable, and we hope, with the recent interest given to this important application of electricity to soon see a system evolved suitable to all the varied conditions of lighthouse illumination by the electric light.

GENERAL WESTERN NEWS.

On the 28th of November a bill was filed in the circuit court by Charles W. Bregn and James M. Ball against the Board of Trade Telegraph Company, E. S. Stokes, C. H. Read, Dwight Townsend, A. W. Dimmock and Richard Newcomb, asking the appointment of a receiver for the company.

The organization dates back to 1881, with a capital stock of $750,000, and in October of the succeeding year it issued $50,000 of bonds secured on all its property. Last year all the company's lines were leased for ninety-nine years to the Bankers and Merchants' Company. Then the B. and M. failed and Judge Blodgett appointed L. D. Parker receiver of the combination resulting from these two movements, and he has been operating them under his receivership.

Then comes the foreclosure sale in New York against the B. and M., with E. S. Stokes as purchaser, not only of the B. and M. but a majority of the stock of the Board of Trade Telegraph Company. Stokes, who is president of the United Lines company, is trying to *organize* the Board of Trade lines into his system.

Judge Blodgett has been petitioned by the Stokes faction, asking that the B. and M. Co. be compelled to turn over to them the Board of Trade Company's property, while the complainants ask an injunction to prevent any incumbrance of the lines, the issue of any bonds, or the making of any lease, and for the appointment of a receiver for all the company's property.

The United States Company has just finished the extensive plants for which contracts were awarded in July last by the County Commissioners. Of these plants there are five: the Court House, Hospital, Infirmary, Jail and Insane Asylum. The aggregate of lamps in the various plants is nearly four thousand, all of which have been tested and found ready for business.

At the same time the United States Company has had other, smaller, local plants to instal, including a daily newspaper office, and a large mercantile building on West Madison street.

The plant at the Court House was very thoroughly inspected on the 3d inst. by County Commissioners Van Pelt, Klehm, and Wasserman, accompanied by Manager Warren of the United States Electric Company. The commissioners appeared highly pleased with the exhibit, and, indeed, so expressed themselves, and so did the "sisters and the cousins and the aunts," as well as the male portion of the country employes in the building. The visit of the Fathers was made the occasion by the clerks and heads of departments, to make sundry suggestions relative to positions of lights, kinds of shades, additional lights for particularly busy desks, etc. One of the clerks liked the light very much, but objected that "it was so much hotter than gas," and was completely non-plussed when one of the gentlemen present took the lamp out with his naked hand.

The two rival companies—the Edison and the United States—now have plants in such close proximity that a comparison of the two systems is as easy as rolling off a log. The former lights the city building—about 1,200 lights—and the tunnels, and the latter the County building—about 1,200 lights—each with four dynamos, and otherwise similar in a general way as two plants of different systems could well be. The buildings are on the same square contiguous, and nearer alike than children of the same mother usually are. The citizens are at liberty to select, in the language of the old showman: "Which hever you pleases, my little dears. You pays your money, and you 'as your choice."

A movement is said to be on foot by which a branch or a something similar to the Signal Service, is proposed for the National Guard. The recent success of the flash-light signals in captive balloons in England and on the continent should be considered in connection with this suggestion. Flags and similar ocular signals are useless at night, but an incandescent light suspended in the air, now that these are made sufficiently large to nearly rival an arc lamp for luminosity, operated by a telegraph key, can be, and have been used successfully. An experiment of that nature might be undertaken here, where we have all the prerequisites necessary.

The National Guard for whose benefit the experiment might be tried; the dynamos, the large incandescent lamps with plenty of skilled labor to match; the gas at $1.00 a thousand to fill a balloon; and as for operators to write and read the signals—why, the woods are full of them. All that is needed to put the whole matter in course of full operation is an order from Washington; the rest we have ready at a moment's notice.

And we need just this kind of appendage to our civic military. Within the past year a new form of drill has been taught our National Guard, adapted to the suppression of street riots which, judging from the sham battle fought with an imaginary *emeute* on Thanksgiving day, must certainly be effective, and thorough; collateral proof of which is to be found in the anathemas of the socialists at their Sunday meetings.

Sharp, quick work in the suppression of riots is the most merciful treatment and to accomplish this, when desperate means are necessary, all modern appliances should be made available. Let us have captive balloons and incandescent signals—the sooner the better.

A Milwaukee correspondent of one of our journals gives some interesting particulars relative to the telephone business there, and throughout the State.

The Milwaukee Exchange is now six years of age. The local organization was enlarged in 1882, and the entire State, by purchase and re-organization, came into its control, under the name of the Wisconsin Telephone Company. The company has now fifty-two exchanges, with from fifteen to two hundred and twenty-five subscribers, exclusive of Milwaukee, which numbers about 1,500. Toll lines reach 140 towns in the State, with a total wire measurement of 2,900 miles, 400 of which have been strung during the present year.

The fact that the stock of the company has never been below 100 is of itself an evidence of the thrifty condition of the business, and so satisfactory are both the rates and the service that there is a rapid and constant increase in the list of patrons. The rate of rentals is based each year upon the number of times the telephone was used the previous year, so that subscribers know pretty nearly how much they pay for the service, and are better satisfied with the result than if they paid a stipulated sum irrespective of the use of their wires. Every call is recorded, and subscribers have in several instances checked the company's account of calls by keeping a record for themselves The two accounts in the majority of instances have so nearly tallied that perfect confidence in the office account is the rule.

Long-distance telephony is in daily use by the Wisconsin people, circuits of 250 miles in length working to the entire satisfaction of subscribers.

The grand round-up on the electric-light ordinance was brought to a close on the 28th ult. As premised in last week's REVIEW, the war is over. Mr. Badger thoroughly convinced the Mayor that his company was not only competent to carry out its agreements but that it was anxious to commence at once, and Mayor Wallber signed the ordinance.

The survey will be made and the work of installing the plant be prosecuted as rapidly as possible.

Some industrious news-gatherer has lately made the wonderful discovery that the iron in Brooklyn bridge is magnetic. If the gentleman will apply the simple test of an ordinary compass-needle to the heating coils in the editorial room he will discover the same phenomena, and the first time he is waiting for a street car, the same simple test will show him that the track rails are down with the same complaint; or, when tired and belated, while leaning against a lamp post on some detective work, which is to enrich a journalistic sensation the next morning, indications of polarity may be shown in that iron column. He may even go farther, and at his first visit to the lock-up, try the cell bars, with the same result. In a word, from the hair-spring of a watch in the original package, to the frame of a trip hammer, he will hardly go amiss of finding magnetic polarity in any mass of iron, however large, which is in a fixed position.

The matter of sidewalk-area rights is still unsettled. Except in occasional cases the occupants or owners of property abutting on the routes which the electric-light people desire to travel, are easily satisfied when properly approached, and made to feel that they are granting a reasonable favor instead of being made to consider that they are victims of legal compulsion. But there are individual cases of stubbornness which cannot be overcome with the most careful application of coaxing and flattery. One instance is mentioned where an individual was so wrought up that he ordered *all* the wires entering his own building cut, because they came under the sidewalk, in violation of his rights as a property holder, and, to use an old simile, "he cut off his nose to spite his face."

The Sperry folks have closed a contract with the Board of Trade and other parties interested in lighting up the neighborhood, which is to result in the placing of a circle of twenty large arc lights of the "all-night" variety, on the highest available point of the tower of the building, 340 feet above the street. The work of placing the supports has already commenced, and completion is promised before the incoming new year shall have made its *debut*. The worthy president of the council of Milwaukee is not endorsed in Chicago, by a large majority. It is very doubtful if there are not as many consumers using, and satisfied with, the Sperry light to-day, in Chicago, as there are of any other arc system. What was said in these columns was not an opinion, but the record of another's opinion; and the same may be said relative to the whole Milwaukee matter. The REVIEW's portion of the Milwaukee squabble was neither theory nor opinion, neither hope, endorsement nor belief: nothing but history.

S. G. Lynch reports telephone stock values as follows:

Chicago	$375 @	$400
Central Union	51 @	53
Michigan	65 @	67
Iowa Union	18 @	20
Great Southern	28 @	30
Colorado	15 @	20
Rocky Mountain Bell	40 @	45
Mo. & Kas.	55 @	58
United	15 @	16
Cumberland	70 @	75
Wisconsin	110 @	112

CHICAGO, Dec. 7, 1885.

IN FAVOR OF THE AMERICAN BELL.

The facts in the new hearing in the Drawbaugh telephone case, at Syracuse, are these: The Drawbaugh testimony was all stipulated into the Overland case, and, after the Drawbaugh case was decided by Judge Wallace, the Overland people went ahead and took further testimony tending to sustain the Drawbaugh claims. This testimony not being in the original Drawbaugh case, was allowed to go in by the Bell attorneys under stipulation, and the question then remained to be argued as to the effect that it would have on the original testimony. The argument was heard by Judge Wallace at Syracuse, as we mentioned in our last issue, Judge Hill appearing for the Drawbaugh people and speaking at considerable length, his argument lasting three and one-half hours. Judge Wallace, after considering the new testimony, promptly rendered a decision to the effect that it did not change his former opinion. We give the decision in full, which is as follows:

UNITED STATES CIRCUIT COURT—SOUTHERN DISTRICT OF NEW YORK.

American Bell Telephone Company *et al. agst.* the People's Telephone Company *et al.*

Wallace, *J.*:

Since the decision of this case in December last, additional proofs have been taken on the part of the defendants, and by consent of complainants have been presented for th further consideration of the court after argument of counsel.

All the new evidence is cumulative merely. Such as consists of the testimony of new witnesses to knowledge of the existence of Drawbaugh's talking machine prior to the date of Bell patent, is far less persuasive than much which has already been considered and rejected as incredible. Such as is intended to show that the earlier instruments made by Drawbaugh were capable of practical use in transmitting articulate speech is more important. The instruments which were introduced as reproductions of lost originals, representing Exhibits B, F and C, and which were constructed by Drawbaugh, or under his supervision, as accurate productions of the originals, were shown to be practically inoperative. After they had been introduced in evidence, and the expert witness for the defendants had testified that he had found them to be good practical instruments, a test of their efficiency was made at the request of counsel for the complainants, which took place in the presence of the experts and of the counsel of both parties. This test, which was made in 1862, indicated decisively that the testimony of a large number of witnesses respecting experiments with Drawbaugh's earlier instruments, on various occasions in the years 1869 to 1876, was unreliable. While, according to the testimony of these witnesses, the instruments invariably operated satisfactorily upon the occasions of which the witnesses spoke, and no difficulty was experienced or observed by them in the transmission of the messages sent over or heard through the instruments, it was demonstrated by the experiment in 1882 that under more favorable conditions speech could only be occasionally transmitted by the reproduced instrument, and that generally what was spoken, if transmitted at all, was transmitted in a fragmentary or incoherent form. Whether these instruments were, in fact, reproductions or the original instruments, was a question which depended solely upon the testimony of Drawbaugh. But assuming that his testimony was true, and that they were reproductions, it was impossible to doubt that they were the best that Drawbaugh knew how to construct after he had become a much more accomplished electrician than he was when, according to his testimony, he made the originals.

Since the former decision, new reproductions of these alleged originals have been made from the remnants of the originals, supplemented by drawings verified as correct by Drawbaugh from memory, and it now appears that these productions are practical instruments, and fully capable of transmitting articulate speech successfully. It does not appear that Drawbaugh made them or who made them; and no testimony has been introduced to explain the reason of the failure of the instruments made by Drawbaugh to operate satisfactorily. It appears from the testimony of the only witnesses adduced to the point that, upon a comparison of the former and the recent productions, the recent ones are improved in finish and detail of mechanism in respects calculated to improve the efficiency of the apparatus; and it also seems probable that the increased efficiency of Exhibit F the more important of the reproductions, is due to the employment of a new conducting material between the back plate of the cell and the diaphragm of the transmitter, adapted for the adjustment in a mode never practiced by Drawbaugh, and made the subject of a patent to Henry Hunnings of the date of August 31, 1881. The legitimate effect of the evidence is to show that Drawbaugh was very near the realization of the invention if he had really constructed instruments like the Exhibits F, B and C prior to the date of Bell's patent. It does not, however, alter the fact that he was unable to make such instruments at a period long subsequent to the time when he claims to have made them; and in view of this fact the evidence does not tend to materially fortify the testimony of the witnesses who think, or profess to think, that they heard or saw efficient practical instruments in operation at Drawbaugh's shop on the occasions to which they refer. The conclusions that were reached at the former hearing have not been modified, and the decree ordered should not be disturbed.

Telephonic News

*** The Electrical Supply Company of Ansonia is enlarging its factory by an addition of 41x71 feet.

*** Albany, N. Y., is giving the Oram Telephonic Time-repeater a trial, and the probabilities are that this valuable addition to the service will be adopted by the telephone company.

*** The Police Commissioners of New York have authorized an attempt to substitute the telephone for the present system of telegraph communication between the stations and the Central Office. Other cities are several years ahead of them.

*** Owing to the number of telephones removed since the advance in rentals, the company has discontinued the central exchange office, Gardiner, Me. The remaining half dozen out of the original 65 instruments will be operated through the Augusta office.

*** It is expected that the decision of the Secretary of the Interior, in the telephone case, will be rendered within a day or two. The opinions of the Commissioner of Patents and of the two Assistant Secretaries have already been prepared and handed to the Secretary. It is stated that they all agree in recommending that the validity of the Bell telephone patents be tested in the courts. This is expected to be the decision of the Secretary of the Interior also.

*** It has long been known that shippers are unwilling to carry large quantities of zinc dust in their vessels, owing to the danger of its getting moist and becoming heated to a dangerous extent. Mr. Greville Williams, F. R. S., has recently made some researches which throw light on this matter. He finds that wetted zinc dust, after drying, gives off nearly double the hydrogen that unwetted dust gives. Hydrogen is absorbed from a moist atmosphere at moderate temperature by zinc dust. It has, in fact, the power of occluding hydrogen after the manner of spongy platinum.

*** It is well known that Mr. W. H. Preece made some very interesting experiments with a telephone receiver, consisting of a fine wire stretched, and having one end attached to the center of a diaphragm. When a current from a microphone transmitter was sent through the wire, the diaphragm reproduced the sounds. Some further experiments in this direction have been made by Mr. C. R. Cross, at the Massachusetts Institute of Technology. The heaviest wire used was 0.0095″ in diameter and its material platinum. With a length of 6″ the maximum effect obtained by Mr. Preece was observed. On using a wire .004″ in diameter, and a current sufficient to raise it to a dull redness, very remarkable results were obtained from a length of 6″ to 7″. Not only could the most familiar conversation be understood, but the words could be heard when the ear was placed at a distance of from 2″ to 10″ from the diaphragm of the receiver; the character and loudness of the sound being similar to those given by the Hunnings transmitter, with an ordinary magneto receiver. When a still shorter wire at the same temperature was used, a decidedly better quality of sound was produced, but the loudness was materially diminished. Lowering the temperature rapidly diminished the loudness of the sound. German silver gives good effects, but is not so susceptible to temperature as platinum. Copper and iron gave unsatisfactory results. The battery used was of the type known as Grenet, and from one to ten cells were tried. The best effects were obtained from the wire .004″ in diameter, and the remarkable point is that the raising of the temperature to red heat greatly enhanced the loudness.

A Statement From Mr. Baldwin on the Testimony in the Telephone Hearing.

Editors Electrical Review:

Referring to the report of the Telephone controversy in your paper of this date, will you in justice to me kindly publish the following:

1st. I never was Eaton's counsel, or had anything to do with the Spencer case; consequently it was impossible for me to have betrayed his interest.

2d. To maintain Gray's present contention, it was necessary to sacrifice not only a counsel who had served him faithfully and successfully for years, but a warm personal friend—hence the unjust and unfounded attack on me. This has been fully met by proof filed in the case, but ignored in the press reports.

The briefest synopsis of this proof would take up more space than you can probably spare. It is sufficient to say that any charge of want of fidelity to Gray's interest on the part of his counsel is absolutely false; that Gray failed to contest the grant of Bell's patent, or the right to the invention, of his own free will, and with full information of all the circumstances; that *in March*, 1877, *he conceded priority to Bell without even the knowledge or consent of his counsel, who were ignorant of it for months afterwards;* that the agreement of the Western Union with the Bell Telephone Company was not made until the fall of 1879, after all defendant's testimony in the Dowd case had been taken in the best possible shape for defendants; that all the subsequent proceedings were known to and approved by Gray; that his counsel (the writer) refused all retainers under the Bell patents up to November, 1884, and then reserved Gray's rights, as well as those of other defendants, by whom he had been retained ever since 1879, against these patents. Yours truly,

W. D. Baldwin.

Washington, D. C., Nov. 21.

*** Charles Fisk, of the firm of R. A. Fisk & Son, Pacific Electrical Works, of Sacramento, came up from Sacramento yesterday by private conveyance, to view the route for a new telephone line to connect the two places. The line will be built for N. D. Rideout and the Buckeye Mill Company, of this city, and the Pioneer Mill Company, of Sacramento, and will connect the banks and the mills of the two places. The material has all been ordered and the work of construction will be commenced on the first of December. It will be built along the public highway to avoid the telegraph lines along the railway, as the heavy currents of electricity on the latter interfere with and obstruct the working of telephone lines coming within their influence. When this line is finished it can be connected with the Willows via Oroville, Chico and Jacinto, a distance of over 150 miles, and will further increase in length what was previously the longest private telephone line in the world. —*Mayscille* (Cal.) *Appeal.*

*** A lengthy discussion on overhead wires and underground telegraphy was indulged in by the Electrical Committee of Councils, at Philadelphia, and representatives of the Western Union, Philadelphia Local Telegraph and Bell Telephone Companies. Mr. Henry Bentley, president of the two last-named companies, said they were prepared to bury a good portion of their wires between Vine and South streets and the Delaware and Schuykill Rivers, but they were not willing to give such a bond as the City Solicitor had prepared. If the bond was modified so that the companies would not be obliged to waive any of their vested rights they would give good and sufficient security to carry out the provisions of the ordinance in question. Superintendent Gill, of the Western Union Telegraph Company, spoke in a similar vein. He said his company was making an honest effort to bury its wires, and had already spent $20,000 in this city in making experiments; but it would not agree to give such a bond as had been demanded, as it was claimed that the company would forfeit its rights. Upon motion of Mr. Patton it was decided to refer the matter to a sub-committee, with instructions to consult with the City Solicitor and prepare an ordinance satisfactory to all concerned.

On Magnetization Produced by the Discharges of Condensers.

By M. Ch. Claverie.

It is known, since the experiments of Savary, that if we pass the discharge of a condenser in the neighborhood of a steel needle, this needle will be found magnetized, sometimes in one direction, sometimes in another, with a variable intensity depending upon multiple circumstances.

The explanations of the anomalies observed, proposed by Savary, and subsequently by Verdet, rest upon the hypothesis that each of the steel needles is magnetized in the same direction in its entire thickness. It seems, indeed, that with needles of the diameter of those employed by Savary ($\frac{1}{2}$ millimeter) it must be so. Most frequently it is nothing of the kind.

If we pass the discharge of a battery near a needle of tempered steel, and if we eat away this needle progressively with hydrochloric acid, determining the magnetic power at equal intervals of time—*e. g.*, every ten minutes—we generally find in the interior of the steel magnetizations alternately in opposite directions, and which have penetrated to different depths.

My experiments have been made with a battery of twelve elements of a capacity of about $\frac{1}{100}$ microfarad. The steel needles were placed along the axis and at the center of a magnetizing coil of 300 meters in length and thirteen millimeters in diameter. This spiral was made of a copper wire well insulated, and of $\frac{1}{2}$ millimeter in diameter. The field produced by a current of the intensity 1 has in the middle of this spiral an intensity $9\pi \times 1.998$, and 0.05 meter on either side of the middle of this intensity is still $9\pi \times 1.9975$. We may, therefore, admit that a needle of fifteen millimeters in length, placed in the middle of this coil, has all its points in a uniform field. The difference of potential between the two poles of the battery was regulated by the distance between the two balls of a discharging rod, fitted with a micrometric screw.

Whatever may be the distance, if all the communications are metallic, we obtain in a needle of hard-tempered steel, capable of breaking against glass, superposed magnetizations, of which I will give the following example: The explosive distance being ten millimeters, and the needle having the length of fifteen millimeters and the diameter of $\frac{1}{2}$ millimeter, I have found, after successive corrosions in hydrochloric acid of ten minutes each, the following magnetic powers, referred to an arbitrary unit:

$+20.5, +14.5, +5, -5, -11, -15, -18.5, -13.5, -16, -13, -9, -6, -3.5, -2, +5, +7, +8, +10.5, +12, +11.5, +11, +8.5, +6.5, +6, +3, +2, +1, -0.5, -0.5 + 0.5$, the sign + indicating magnetization conformable to Ampere's law.

It is known, on the other hand, since the experiments of Fedderson on the discharge of condensers, that with a sufficiently low resistance of the circuit the discharge oscillates from one pole to the other with a gradually decreasing intensity, and that it is thus if we determine the discharge through a metallic circuit. If we increase the resistance progressively by means of the intercalation of liquid columns, at a certain point the discharge, instead of oscillatory, becomes continuous.

If we pass a continuous discharge near a needle of hard-tempered steel, we not only never observe any reversal in the direction of the magnetization, which is always conformable to the law of Ampere, but the magnetization has the same direction in all parts of the needle where it penetrates.

On interposing in the circuit of the battery a column of sulphate of copper of 112 millimeters in length and three millimeters in diameter, an explosive distance of eight millimeters is sufficient to magnetize the needle up to the axis, as may be found by means of successive corrosions with hydrochloric acid. Stronger discharges corresponding—*e. g.*, to explosive distances of 10 and 12 millimeters—give the same magnetic momentum, and the same magnetization throughout the whole thickness. Discharges corresponding to less explosive distances give feebler momenta and a less profound magnetization.

If it is true that magnetization penetrates to depths so much the greater as the discharge is more intense, then on passing two successive discharges in opposite directions, the second being the stronger, this latter should produce the same magnetization as if the former had not existed, which is confirmed by experiment. But if the second discharge is the weaker, and does not penetrate to the axis, it may give a null or a negative result. On corroding the needle with hydrochloric acid, we should then find in the superficial layers the magnetization produced by the second discharge, and in the deeper parts the magnetization produced by the former, as it is again verified by experiperiment. If we submit one and the same needle to discharges progressively decreasing, and which are in contrary directions, the first alone magnetizing the needle to the axis, then, on corroding the needle with hydrochloric acid, we find successively all the magnetizations corresponding to the different discharges.

I believe that I have demonstrated in the foregoing that currents of very brief duration, produced by the discharge of condensers, magnetize steel like other currents, in conformity with the law of Ampere. Whenever the discharge is continuous, the south pole is to the left-hand of the current. In the case of oscillating discharges, the needle receives at depths progressively decreasing magnetizations alternately in opposite directions. The first ones may penetrate to the axis, and thus destroy each other completely. The resulting magnetization may be sometimes in one direction and sometimes in the other, according to the direction of the last of the magnetizations which have penetrated to the center, and that of the superficial magnetizations. The direction of the resulting magnetization depends evidently in great part on that of the superficial layers, whose section, for a given thickness, is much greater than that of the deeper strata.

This is the explanation of the anomalies observed by Savary.—*Comptes Rendus.*

A Strong Endorsement.

The magnificent Drake block, St. Paul, was on fire but a little more than a week ago. Few reading the announcement of the fire and its prompt extinguishment, almost without damage, failed to recall the disaster which wiped out the original Drake block on the same site, and the escape of the present structure was and is a matter of universal congratulation. The fire started in a remote part of the building, late at night. Neither its sleeping inmates nor any other human being knew of the danger until an alarm was given at the central fire-hall, exactly locating the fire. The department went directly to the building, and to the floor and room where the danger lay, guided by an unerring messenger, and the chemical extinguished the flames. The Mercurial Automatic Fire Alarm was the agency through which this notice and direction were given, and by which the department was informed of the exact building, and exact part of the building, which was on fire. Mr. Drake's letter to the Western Electric Company, published below, expresses his opinion of this wonderful appliance, which in this one instance has doubtless saved more to St. Paul and to the insurance companies than it will cost to protect the whole business part of the city by its use. This fire is one of the numerous instances on record where the arrival of the fire department, brought by this vigilant watchman, has been the first announcement to inmates of a burning building that they were in danger. This is Mr. Drake's letter, and between its lines prudent property holders will read an admonition to secure safety in the same way that Mr. Drake secured it:

St. Paul, Nov. 21, 1885.—Western Electric Co., Chicago, Ill.—Gentlemen: The mercurial fire-alarm placed by you in my office building on Third street demonstrated its usefulness last week. By some means—the cause unknown—probably a cigar set on fire some sawdust in a box in one of the office rooms, about 11 o'clock at night; the mercurial gave the alarm to the fire department, and brought out the force before those sleeping in the building knew that a fire was burning. The fire was put out with small damage by one of the chemical engines. My experience justifies me in unqualifiedly recommending your alarm to the public.

E. F. Drake.

The Edmunds Postal Telegraph Bill.

One of the most interesting announcements in connection with the approaching session of Congress is to the effect that Senator Edmunds will again introduce and press a measure for the establishment of a government telegraph. It is safe to assume that the measure will be substantially identical with the bill introduced by the senator from Vermont at a previous session of Congress. The main feature of that measure was the erection by the government of a system of trunk lines of telegraph connecting the principal centers of the country, and their operation in connection with the Post Office Department, for commercial business at low rates. The bill does not contemplate, therefore, the absorption of the existing telegraph lines by the government, but rather the entry of the government into the field of commercial telegraphy as a competitor with the present corporations. From the remarks of the senator in connection with his former bill, it may be gathered that the objects in view in this proposed action are the utilization of the resources of the government in erecting a system of wires between the centers of population by which a permanent competition may be maintained with the existing lines, and which, at the same time, would serve to some extent as a source of information regarding the actual cost of telegraphic service. It is, of course, to be expected that this or any other measure of the kind will be opposed before Congress by the Western Union and other companies in all possible ways.

The subject of governmental action in connection with the telegraphic service is constantly growing in importance. The question of what form it shall take so as to secure the best results is, however, one not easy of solution. The remedy usually suggested is the taking over of the existing lines by the government. Besides the objection to this, on the score of a vast increase in the civil service—a thing hardly to be desired until the poison of the spoils system has been eradicated—it is extremely doubtful whether the people would sanction the taking over of the telegraph lines at a cost to the nation approximating their present capitalization. The only acceptable measure in such action would be the value of the existing plant, estimated on the basis of the cost at which it could be duplicated. The large amounts of fictitious and watered capitalization, represented in the stock of Western Union, would certainly prevent any other treatment. It is also to be remembered that the present competitive rates between the principal points east of the Mississippi river are relatively lower than in any other country in the world, and that it is doubtful whether government telegraphy between such centers could be conducted at the present competitive rates without loss to the government.

The main object sought by the Edmunds bill being the maintenance of competitive rates, it seems that the same object could be attained by simpler means than by the government itself entering the field. An act of Congress of 1866 granted certain privileges to telegraph lines, in connection with rights of way along post routes, and over the public domain. In return, however, for the privileges granted, the companies, in accepting the provisions of the act, consented to the acquisition of any or all of the lines by the government, at a valuation to be decided by arbitration. In the decision known as the Pensacola Telegraph case, this act was affirmed by the Supreme Court, and the power of Congress to regulate the telegraph lines pretty well indicated. Perhaps it would not be practicable or desirable for Congress to attempt to prohibit, by legislation, any further consolidations, amalgamations or poolings. But it would certainly appear within the province of Congress to fix the present competitive rates as the maximum of charges. The companies would not complain of such action. Western Union especially boasts of its ability to continue the payment of dividends under the present scale of rates. Further, it would certainly be within the power of Congress to compel the land-grant and subsidized roads to perform the obligations imposed by their charters on themselves, furnishing a telegraph service for commercial messages. At present, these roads, without exception, have transferred their telegraph lines to the Western Union, in defiance of the plain provisions of their charters. Legislative action could, no doubt, be effectively used in forcing them to conform to their obligations in respect to telegraphy, with great benefit to the entire section west of the Mississippi. It is well worthy of inquiry whether the direct exercise of the power of Congress upon the existing companies may not be found to be, for the present at least, the most effectual means of governmental interference with telegraphy in the interest and for the benefit of the public at large.—*Bradstreet's.*

Reform in the Telegraph Service of Mexico.

The reforms which the new Director-General of the Government telegraphs is carrying out give promise that, before long, the Treasury will not be compelled to make a heavy outlay for this branch of the public service. In fact, we believe that Director-General Islas will soon have brought the service to a paying basis, rendering it entirely independent of the Treasury. This great reform will be due to his executive ability, and to the earnest support he is receiving from President Diaz and the Minister of Public Works, General Pacheco. Without their co-operation, Mr. Islas could not easily carry out his far-reaching plans, which involve the discharge of a host of utterly useless officials, who have for years been quartered on the Government telegraph service by influential politicians.

The first great change in the service has been successfully accomplished. We refer to the transfer of purely local and minor lines to the several States. These minor lines being of merely local importance, it was proper that the States should take them, agreeing to maintain them in good working order. The Government has reserved to itself those lines connecting the national capital with the State capitals, and the chief cities and most important towns of the republic. For military and political reasons, these lines, which may be termed the "trunk lines," should be controlled by the Government. The second great change in the service is the reorganization of the district staffs, putting the several districts under charge of competent telegraphers of good executive ability, and cutting off all superfluous officials. This has yet to be carried out, but, with the moral support Director-General Islas has from the President and minister mentioned, he will be able to satisfy the expectations of the public. Already the central office here at the capital has been cleared of all needless officials, and the force in the Callejon del Espiritu Santo has been reduced two-thirds, not only without detriment to the service, but with positive benefit. The central office is now self-supporting, where before there was a monthly deficit of $600. A spirit of business activity now pervades that office, and we heartily congratulate Director-General Islas on having accomplished in his department that reform work which has been successfully carried through by Postmaster Nava in the mail service of the capital. The work of these two excellent officials shows that it is still possible for the Government to attract to its service men of genuine executive ability, and it ought to be a matter of pride to the nation that such reforms as we have indicated can be carried out in spite of the angry remonstrances of professional politicians who live at the expense of the Government. It is just this sort of work which is being accomplished in the American Government departments by President Cleveland and his reform cabinet. The chief officers of the Washington Government are working with energy to make the Government service a matter of pure business, as it should be. This is an exhibition of civil service reform which the taxpayers will understand and applaud. We believe that the President of the republic will stand firm against political pressure from selfishly-interested persons, and, by making the telegraph service self-supporting, add to his reputation as a skillful organizer and financial economizer.

The Government of Mexico belongs to the people and not to the politicians, and the spectacle of a great reform carried fearlessly into execution will receive, as it deserves, the applause of the nation. The same firm-handed policy should be applied to the customs service, and, where one man can perform the work now done by two or three, the superfluous officials should be dismissed, and allowed to earn their living by their labor, as do the mass of the people.—*Mexican Financier.*

....The telegraph boys at Galveston, who suffered by the recent fire, have been remembered by the fraternity very handsomely. J. H. Bunnell & Co., of this city, are among the donors, a check for $200 having been sent by them. Successful telegraph men are always generous, as the operators, who occasionally strike hard luck, well know.

....The extensive wire and iron works of the Barnum company at Detroit, were almost totally burned Dec. 3. The works covered a whole block and were one of the largest establishments of its kind in the United States. The loss is estimated at $262,000; partially insured. Telegraphic communication with the city is seriously interrupted, many of the wires running into the city being strung over the works. The structure was a four-story brick building.

....The Supreme Court of Louisiana affirmed the judgment of the lower court in the cases of the Baltimore and Ohio Telegraph Company *vs.* Morgan's Louisiana and Texas Railway Company and the Western Union Telegraph Company. This suit was originally brought to enable the Baltimore and Ohio Telegraph Company to build its line in the right of way of the railroad company between New Orleans and Lafayette, La, 144 miles. This right was awarded, damages assessed and paid into the court, and the case appealed in the interest of the Western Union Telegraph Company, which claimed an exclusive right of way under its contract. The decision establishes the right of the Baltimore and Ohio Telegraph Company. The motion of the Western Union Company to remove the case to the Federal Court was denied.

How the Correct Hour is Known in the Departments.

The recent action of Chief Clerk Youmans, of the U. S. Treasury, in enforcing the rule that clerks shall be at their desks promptly at 9 o'clock in the morning, reminds one that there is no city in the country where having the correct time receives so much attention as in Washington. The clock at the national observatory, which is connected with the Western Union Telegraph Company's wires and gives the noon signal all over the country, is also connected with several hundred other clocks through the government departments, and is substantially duplicated as to the accuracy of its time. The new pension office building has sixty of these clocks placed through various portions of the building, and there are but few public buildings that are not now provided for. In the Treasury Department building another one of these clocks will soon be placed in the vestibule of the north entrance, where it will be in full view of tardy clerks, who will have a sickening feeling come over them when they see the hands pointing to 9.10, and think of the card of warning they will receive from the chief clerk later in the day, saying it must not be repeated.

The scene about these clocks at noon is an interesting one. A group of clerks always come with watch in hand and wait until the sun is exactly over the seventy-fifth meridian, when the minute and second hands of the clock, if it be either fast or slow, will give a jump to the exact hour, and all these several hundred clocks then show the same time without a second's difference. Then the watches are corrected and regulated. These clocks are of the ordinary kind, and those who control the patent for regulating them by electricity refuse to sell them, except to the Government, which pays $25 a piece for them, but charge a yearly rental of $40, which includes keeping the wires which connect them in repair.

Besides the clocks as a means of getting the exact time, there is a time ball surmounting the State, War, and Navy Department building, which can be seen over a large portion of the city, and by which innumerable watches are regulated.

This matter of having the precise time has become epidemic, and there is nothing the government clerk prides himself more on than to show his fellow scribe, when the noon time is announced, that his watch has not varied since the day before, and is as regular as the sun itself.

TELEGRAPHIC

.... Woonsocket's citizens are asking for the fire-alarm telegraph.

.... The Baltimore and Ohio Telegraph Company has cut telegraph rates from New York to Boston, Providence, Hartford, New Haven and all prominent New England points, from 25 cents for 10 words to 10 cents for 10 words. The Western Union rate is 25 cents for 10 words.

....In Brazil the air lines have to contend both with the natural decay, rapid as that is in a tropical country, and with the sudden fall of the temperature at sundown, that causes wires and insulators to break by contraction. All nature is leagued against them. The luxurious vegetation of the tropics, despite all attempts to keep it down, causes no end of trouble. Birds build their nests on top of the poles, and ants up their sides, while skunks and armadillos undermine them and cause their sudden fall. The ants' nests have to be chopped off with axes, when old and hard. Wasps build nests in the bell-shaped porcelain insulators, apes meddle with the wires, and enormous swarms of birds, flying by night, often wreck or tangle them. More mischievous than any of these is a huge spider that weaves its web between the wires and interferes with the electric currents. Worst of all, the tremendous tropical thunderstorms smash wires, poles, insulators and all, almost daily in their season, despite all precautions.

....According to M. Fremy, nitrogen exercises an important influence on iron, and steel is due not to the presence of carbon alone, but to a combination of iron with nitrocarburets. Careful analysis, however, shows that there is no fixed relation between the properties of nitrogen and carbon in either steel or iron, and also that the proportions of nitrogen are found to vary, while those of carbon are more constant; hence it has been supposed that the presence of the former is more or less accidental and unimportant. It is known that there are special "ores of steel" which naturally produce steel at a certain stage of fining, but which by still further fining pass into iron; again, this same iron gives steel of a superior quality for cementation. All metals, in fact, undergo remarkable changes through the influence of exceedingly small proportions of various foreign substances. Copper is partly modified by the merest trace of oxygen, sulphur or lead, zinc or tin by only a few tenths of one per cent. of iron, and gold is made brittle as antimony by one one-hundredth of one per cent. of lead or bismuth.

.... A Syracuse business man has discovered among his papers a statement of the accounts of the New York, Albany and Buffalo Telegraph Company for 1853. It didn't take a very large sheet of paper for the report. John Butterfield was the president of the company. There was only one office between New York and Poughkeepsie, and only twenty-four in all. Rome and Oneida were the only offices between Utica and Syracuse. The year's receipts from this office were $3,013.63, and the expenses $1,088.19. The receipts from the two offices in the city of New York were $27,835.72, and the expenses $10,912.54. Albany ranked next to New York in point of receipts, that were about $9,000 for the year; Buffalo was third with $6,461 06; Rochester fourth with $4,819.11, and Utica fifth with $3,241.39. Syracuse was sixth. The total receipts for the year were $90,925.60, and the office expenses $28,130.79. "Extraordinary" expenses were $16,434.04. The year's receipts from the Waterloo office were $23.50, Valatia $52.19, and Croton Falls $63.50. President Butterfield accompanies the report with this statement: "The business of the last six months has exceeded that of any previous period."

ELECTRICAL AND SCIENTIFIC

Unwise Economy.

"Oh, no," said Slow,
"I don't believe in advertising.
My trade, you know,
Won't bear it—that there's no disguising."

Down grade his trade
Kept going steadily and daily,
And caused to fade
The prospects that had bloomed so gayly.

* * The Woonsocket Electric Light and Power Company, Woonsocket, R. I., has purchased ground for the erection of buildings.

* * All plumb-lines drawn to the earth's surface continue to its center, showing that walls and other parallel erections are not in reality parallel, and if continued to a sufficient height, a difference would be perceptible in the distance between them. The same rule applies to horizontal lines owing to the earth's curvature, which is 8 inches to the mile, making all lines drawn parallel to its surface similarly curved.

* * In a paper on the size of the brain in extinct animals, Prof. Marsh of Yale College has brought forward the remarkable fact that in the race for life during past ages the survival of any particular group of animals depended upon the size of their brain as compared with that of their contemporaries of the same class. Brains won then, as now, and the brain of animals crushed out of existence was always found to be relatively smaller than that of those outliving them.

* * Prof. Hitchcock, of Amherst College, with a large force of men, has been engaged in unearthing the bones of a huge mastodon at Geneva, N. Y. At last accounts some fifty-four bones had been found, including a tusk eight feet in length and two in circumference at its largest point. The skeleton when completed will be about twenty-five feet in length and fifteen in height. It is the intention of Prof. Hitchcock to have the bones mounted and placed in the Museum of Amherst College.

* * It is predicted that, in the course of the next five years, the steel nail will have as completely supplanted the iron nail as the steel rail has its iron predecessor. Already one-half of the nails manufactured in Wheeling are made of steel, and the machinery and plant necessary for their manufacture are being set up in every nail center and at nearly every nail foundry. It is said that steel nails can be made about ten cents per keg cheaper than those made of iron, even where the manufacturer has to purchase his ingots.

* * The imitation, by hydrodynamics, of the effects of electricity and magnetism, has led M. Decharme to devise what is called a hydrodynamic tuning fork, and which vibrates continuously under the action of a current of water, compressed air or steam, automatically interrupted, just as electric tuning forks do under the influence of an electric current. The construction of this singular apparatus is based upon these principles: First, when two currents of water of opposite directions, and directly facing each other, are issuing from nozzles with thick tips or provided with small discs, there is an attraction of such currents, one of which, at least, is supposed movable—when the distance between the apertures is but a few fractions of an inch, this attraction very quickly increasing in measure as the distance diminishes; second, if, on the contrary, the nozzles have thin tips, there is a repulsion; and third, when the currents are not exactly opposite one another, there is produced, when they meet, an axial direction that tends to bring them to a parallelism and a coincidence of axes. In all cases there may be a vibration.

Steering by Electricity.

A score of ladies and gentlemen gathered on the deck of the Tallapoosa one afternoon last week, at the wharf of the Navy Yard in Brooklyn, to witness a trial of the new steering apparatus furnished by the Electric Steering Company of this city. The inventor, Mr. C. H. Washburn, describes the invention as an automatic electro-pneumatic steering apparatus by which a ship steers her own course automatically. The tiller is worked by compressed air, governed by electricity from the pilot house, and can be thrown completely over from port to starboard or the reverse in a fraction less than three seconds. The automatic principle is obtained by the introduction of an electrical mechanism into the binnacle, which, being attached to the compass at the point to which it is desired to shape the vessel's course, will hold the ship to that point, the motion of the vessel opening and shutting the circuits of the mechanism, which acts upon the rudder and corrects any deviation from the marked course.

The introduction of electricity into the compass-box, it is claimed by Mr. Washburn, has no effect upon the needle. The pilot-house is also equipped with a small hand wheel, acting by electrical currents upon the compressed air cylinder, by which the course of the vessel can be changed from the set course when desired, without altering the position of the "mechanical compass." A small electric lever located on the bridge enables the officer of the deck to take instant control of the vessel and to alter her course at will. The old war-ship is undergoing a thorough overhauling, which resulted yesterday in the displacement of one of the wires from the pilot-house, necessitating a postponement of the trial. The inventor showed how easily the great rudder could be moved at short range, and everybody seemed pleased.

Electric Locomotion.

By A. Reckenzaun.

III.

Absorption dynamometers are seldom, if ever, applied to test steam locomotive engines; the train of loaded vehicles, running at some known speed, is generally considered the most satisfactory dynamometer; indicator diagrams are sometimes taken, and the consumption of fuel per mile run is carefully noted. If the fuel used is found excessive in comparison with similar engines tested under the same conditions of speed and load, then the fault is sought in the engine itself, or the boiler, and then remedied; the steam-engine indicator gives us a faithful record of what is going on in the cylinders; it shows whether the admission and the exhaust take place at the right time, and it gives us a measure whereby the volume of steam expended can be calculated.

On our electrically-propelled vehicle we can also measure the energy expended in a given time or distance by observing the current indicated on the ammeter, and the electromotive force shown on the voltmeter; the product of these two give the energy in watts, 736 watts being, by the latest definition, one electrical horse-power. But this result is not a *direct* measure of the energy expended in the engine which drives the dynamo at the station. On the other hand, the quantity of fuel consumed by the prime mover at the generating station does not merely depend upon the good qualities of the engine or boiler, but on the efficiency of the whole apparatus, which transforms mechanical into electrical and again electrical into mechanical energy, as well as upon the medium of transmission, be it a conductor or a secondary battery. Here we have a chain of operations composed of several links, which are:

First Link.—The prime mover, which consists of a steam-engine and boiler; a waterfall and turbine, or a gas producer and gas engine.

Second Link.—The dynamo or generator of electricity.

Third Link.—The conductor which transmits the current from the generator to the motor on the vehicle, or the secondary battery which takes up energy from the dynamo, and then, when detached from the generator and connected to the motor, gives up its energy to the latter.

Fourth Link.—The electro-motor which receives the electric energy from the conductor, or accumulator, and converts it into mechanical power.

Fifth Link.—The gearing which reduces the (sometimes) excessive speed of the motor to that required by the axle of the vehicle to be propelled.

The efficiency of the whole chain depends upon the goodness of each link, but the strength of a chain is virtually the strength of the weakest link.

As promised in the last article, we will devote a few lines to the description and use of a few absorption dynamometers, brakes, or, as more recently named, "Friction Ergometers;" the latter term is the one adopted by Mr. F. J. Smith, B. A., in his useful little treatise "On Some New Forms of Work-measuring Machines," published by E. & F. N. Spon.

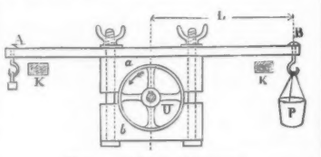


Fig. 1.—Prony Brake.

One of the oldest, cheapest, and, in skilled hands, most reliable forms of dynamometer is the Prony brake, Fig. 1. It consists of a well-balanced and turned pulley, *U*, provided with two wooden blocks, *a* and *b*, which encircle the rim of the pulley, and an arm, *L*, prolonged to *A* in order to balance *B*, when there are no weights in the basket, *P*. For the purpose of testing high-speed machines, it is most important that the lever should be accurately balanced and the face of the pulley to be absolutely concentric and parallel with the shaft, otherwise grave errors (owing to the great speed, which multiplies irregularities a thousandfold) are introduced.

After fastening the motor securely upon a bench or platform of a convenient height, and fixing the pulley upon the projecting shaft of the armature, a continuous stream of soapy water is supplied to the brake, through a funnel not shown in the sketch, from a tank overhead; a tap within easy reach of the brakeman is desirable, so that he may regulate the flow of water to the requirements of the brake blocks. As we are measuring the power of the motor by converting the whole of its work into heat by means of friction, it is necessary, in order to secure uniformity of friction, that the lubrication should be constant. The pressure upon the pulley face is regulated by means of thumb nuts working in easy-fitting threads on the bolts, as shown in the sketch. In starting the motor, some dexterity must be displayed by the brakeman in speedily adjusting the pressure, because, if the blocks are too tight, there is a tendency for the brake lever to be carried round; to prevent such an accident, it is well to provide stops, *K K*, which will give a play of about two inches up or down the horizontal center line. If, in starting, the blocks are too loose, then the pulley (with a series-wound motor) will run round at a furious rate. The brakeman, therefore, should give the command for starting (turning on the switch), whilst he keeps his attention upon the thumb nuts; as soon as he finds his brake well balanced, he gives the signal for the other attendants to take the speed, current and electromotive force; it takes three persons to make the experiment with a motor of more than one or two horse-power, because all the readings have to be taken simultaneously.

To ensure accuracy, it is well to extend the period of one test over half a minute or a minute, during which time the lever must be kept perfectly balanced; any irregularity in the brake will manifest itself on the ammeter, whose needle, if sensitive, will vibrate synchronously with the slightest variations in the coefficient of friction, or the pressure between the pulley and the wood blocks. With a given electromotive force, the speed, and the current of electricity flowing through the motor, is regulated by the weight *P*, in the scale or basket; the greater this weight, the slower will the machine run, and the greater will be the current consumed; the current is a maximum when the brake is so tight that the armature cannot revolve, then the wires forming the circuit are being heated excessively.

The friction surfaces of the brake should be as large as possible, so as to dissipate the heat generated readily, otherwise the pulley gets so hot that the water will be evaporated before it can flow to every part of contact. Mr. Maw (*Engineering*) gives the following practical rule for finding the minimum dimensions of a brake pulley:

$$\frac{v\,a}{\text{H.P.}} = 700$$

where v is the velocity of the pulley face in feet per minute, and a the width of the rim in contact with the blocks; the product of these two factors divided by the horse-power to be measured, should give a quotient of not less than 700.

The horse-power absorbed by the brake is found by formula

$$\text{H.P.} = \frac{2 \times \text{L} \times 3.1416 \times n \times \text{P}}{33000}$$

where L is the distance of the center of suspension of the weight from the vertical center line of the pulley, in feet; n the number of revolutions per minute, and P the weight, in pounds, at the end of the lever L, 33,000 foot pounds per minute being one horse-power (English).

If the length of the lever, L, is taken in meters, and P in kilogrammes, then the formula stands thus

$$\text{H.P.} = \frac{2 \times \text{L} \times 3.1416 \times n \times \text{P}}{75 \times 60}$$

75 kilogrammeters representing one horse-power per second (French).

With electro-motors n is generally very large, 500 to 2,000, according to the size of the motor, and P comparatively small, therefore the utmost care has to be exercised in balancing an ordinary Prony brake.—*Telegraphic Journal and Electrical Review.*

Patent Economic, Battery-Saving Sounder.

We produce a cut of an entirely new "economic" sounder, patented and manufactured by Messrs. E. S. Greeley & Co., successors to L. G. Tillotson & Co., New York, on Morse telegraphs, time telegraphs, district telegraphs, in fire-alarm systems, in burglar-alarm systems, on railroad lines, in brokers' offices, on private lines in country offices, on practicing circuits—anywhere and everywhere that it is desired to reduce expenses and maintain the *statu quo* of a battery, there is a field for the employment of the patent "economic" sounder. The self-shunting sounder contains two sets of resistance, and is so constructed that there is only the usual amount of resistance in its coils (about three ohms) when the circuit is open, so that it responds to the closing of the circuit with all the activity of the ordinary sounder; but as soon as the armature lever strikes the anvil, it throws 100 ohms resistance into circuit, thus preventing the rapid absorption of the battery force, incident to short circuit. As soon as the circuit is opened again and the armature released, the sounder returns automatically to the local basis, with all the rapidity and smoothness of an unchanged resistance. Computation from actual tests over an extended period of time, we are informed, shows that the average saving of battery power in large offices, where the sounder is kept in most active use, amounts to eighty per cent., and in railroad offices, and especially country commercial offices, where the sounder is idle for a large part of the day, the saving runs up to ninety-six per cent. It is well understood that when the ordinary local sounder is in use, the greatest consumption of battery power goes on while the instrument is idle. But skill and science, as illustrated in the construction of the self-shunting sounder, reverses this law so effectually that when the ounder is idle, the consumption of power

is much less than when working. This is the correct scientific theory. It robs nothing from the power of the instrument when the magnets are exerting their force to attract the armature; but when that work is accomplished, it immediately throws into circuit its 100 ohms resistance as a guard against extravagant waste, and no matter how rapidly the work is carried on, it cannot be too quick for this ever-present guard that confines the outlay of strength to the limit of necessity, which has been demonstrated to be, in even the most active work, less than twenty-five per cent. of the whole power usually expended.

It is not alone the expense saved, but also the inconvenience of renewing batteries that is avoided, which feature is invaluable where there is any suspicion of the competency of the attendant to do the renewing intelligently. So far from its use exciting any prejudice in Morse practice, it has been remarked by operators, after having had the instrument in use for some time, the "economic" sounder gives forth a peculiarly soft, agreeable tone, with an entire absence of the racking "thud" of the ordinary sounder, that shocks the oral tympanum, and renders a recurrence to its voice seem notably harsh and hard to a sensitive, highly trained ear. There is a marked difference in tone between that of the up stroke and the down stroke, facilitating, to a surprising degree, the work of the ear in translating the sound, so that the rapidity of the same writing, by reason of clearer partition of the signals, is made to seem much reduced, an old telegrapher declaring that, so far as the labor of the ear was concerned, he would rather read at the rate of forty words per minute on the self-shunting sounder than to read thirty-five words per minute from the ordinary instrument.

Owing to the fact that under the principles of construction upon which the "economic" sounder is based, the cores of the magnets begin to demagnetize as soon as the armature strikes the anvil, and continue in the operation of demagnetization up to a certain limit, the tendency to "stick" is reduced, it is safe to say, over seventy-five per cent.; and for the same reason the armature is more ready to answer to the tension spring upon the opening of the circuit, thus creating additional conditions, favorable to clear enunciation in rapid sending.

—— We understand that Mr. Waterhouse, formerly with the U. S. Company, subsequently with the Schuyler Co., has invented a new system of arc light, which promises something radically new in the way of electric lighting.

——In New Orleans the heavy construction that the Louisiana Electric Light and Power Company has had under way for several months is nearly completed, and by January 1st the entire city will be lighted by electricity. The plant is an unusually complete one, and much of the credit of this is due to the intelligent work of Supt. E. J. O'Beirne.

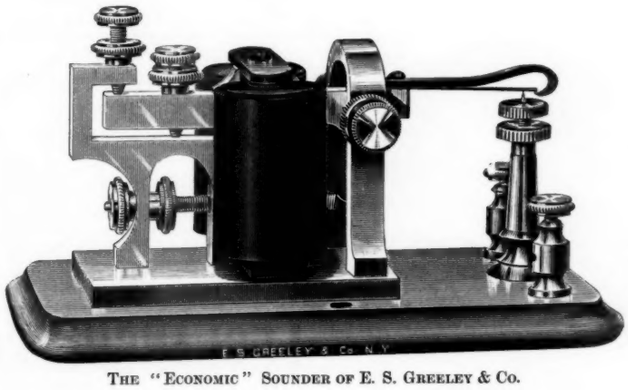
—— Messrs. C. E. Jones & Bro., of 51 West Fourth Street, Cincinnati, have issued a very complete table, showing the dimensions, resistance and capacities of pure copper wire. The part referring to the conductivity of wire will be found particularly valuable by electric light men and others handling heavy currents. Copies of the table will be mailed free to all who send their address to this enterprising firm.

—— A number of the citizens of East Town street, Columbus, Ohio, met recently and consulted with a representative of the electric light company relative to lighting Town street from High street to Parsons avenue with seven electric lights Rev. B. N. Spahr was chairman and J. A. Jeffrey secretary of the meeting. The following committee was appointed to present the matter to the citizens along the street and find out if they favored the project: From Parsons avenue to Washington avenue, Dr. Freeman and Mr. Jeffrey; Washington avenue to Seventh street, S. N. Field; Seventh street to Sixth, Dr. Scott; Sixth street to Fourth, Will Graham; Fourth to High, Peter Hellerman.

—— All the arrangements are now perfected for starting up the new circuit of electric lights contracted for by the city, for the purpose of lighting the streets all night. The location of these lamps have heretofore been published in these columns, and it is therefore unnecessary to give them here. Suffice it to say that they are distributed throughout the more thickly populated part of the town. It is expected that they will be started up for the first time to-night.—*Butte Inter-Mountain.*

—— That was a good idea of Chief Crowley to ask the Supervisors to set up three or four electric lights in the worst alleys in Chinatown. It is shrewdly suspected that some of the most infamous resorts of vice in Chinatown are largely supported by white men, who sneak into them under cover of the darkness and would not for worlds be seen entering such places. By setting up a bright electric light in the worst alleys, the Supervisors would practically close these dens of infamy to all who were not too hardened to feel the pricks of shame. The suggestion ought to be adopted without delay.—*San Francisco Chronicle.*

—— At Houston, Texas, the last of the ten new Thomson-Houston electric lights recently ordered by the City Council, has been erected, and all of the number contracted for are now burning every night. Altogether there are forty-seven electric lights, located on streets and bridges; and at night the city presents a brilliant appearance under the strong, white dazzling rays of science's last gift to mankind. In the suburban portions of the Third, Fourth and Second wards, as well as in the vicinity of the Central railroad shops, much satisfaction has been expressed by the citizens, who, heretofore, and for years, have been compelled to grope in darkness, and they are loud in praise of the lights and the wisdom of the council in having them placed in their vicinity. Not alone are electric street lights a comfort and a convenience to people at night, but they are also in a great measure a positive protection against prowling thieves and burglars. As a matter of fact, districts well lighted are really protected in a police sense from the burglar and the midnight prowler. Houston can boast of being the best and most brilliantly illuminated city by sight in the South.



THE "ECONOMIC" SOUNDER OF E. S. GREELEY & CO.

—— The Bowery, from end to end, is one great glare of electric fire. Two hundred and eighteen electric lights blaze along the pathway. Every theater, every museum, every dive is made luminous by the novel flame of modern invention. No tailor is too poor, no jimcrack store so impecunious that it cannot afford its electric light. The two distinguishing features, in fact, of the Bowery, are brightness and medley. There are quarters in the city where Frenchmen live, Chinese burrow, Italians hive, where Irish herd, but the Bowery is one great commonwealth of nationalities. Every language known to the habitable globe is spoken there. English, Dutch, French, German, Spanish, Down East Yankee, Indian, South American and Japanese tongues may be heard volubly shouting their wares or pressing their commodities. In other days the Bowery was infested by thieves, pickpockets, low women bad men of every sort and kind; but it is as true to-day as it was when the Scriptures were penned, that darkness is the cloak for evil, and that light and brightness are the garments of decency and the good. The police records show that, although there are many disreputable dives on the Bowery, liquor saloons pratically innumerable, Chinese joints by the score and lager beer saloons by the hundreds, deeds of violence are very rare, and brawls and midnight disturbances are among the things of the past.

—— A meeting of the full board of directors of the Consolidated Electric Light Company, of Portland, Me., was held last week at the offices of the company on Exchange street at which President Goff, of the American Electric Manufacturing Company, of New York, was present. The meeting was called for the purpose of considering the rapid increase of the business and the great demand upon the company for increased facilities for furnishing more light to the citizens of Portland. This plant was established two years ago by the American Company, which has continued to own a majority of the stock. The increase of business under the local management of President Rollins and General Manager Sawyer has been rapid and marked. The company has now a capacity of 300 arc lights of 2,000 candle-power each and 500 incandescent lamps of 32 candle-power each, with an annual income of about $45,000 for city and commercial business. The demand for more light is still as strong as it was one year ago—for more arc lights and an incandescent plant for general interior illumination throughout the city. A general plan was submitted and adopted by which the company is to purchase 5,000 square feet of land, in addition to the 15,000 now owned by it, on which to build a new station with boiler and engine capacity of 500 arc lights and 5,000 incandescent lights of from twelve to fifteen candle-power each for residence and general interior illumination. The American Company will supply all the material and construct the new work.

—— An indignation meeting of ratepayers has been held at Belfast, at which complaints were made that the corporation, against whom an order had been obtained for the abatement of a nuisance at the gas works, had done nothing to mitigate it. It was asserted that both health and property were being injured by the emanations from the works, that Belfast foul lime was very much worse than the London lime, that Belfast was twenty years behind London in the matter of gas purification, and that one thousand tons of foul lime certainly polluted an area of several square miles.

—— The Fitchburg Steam Engine Co. report business as fair with them. They have recently fitted out electric-light stations in St. Louis, Mo., Knoxville, Tenn., and are now building an engine for the New London, Conn., station, and Marlboro', Mass., station, furnishing complete outfit—engine, boiler, shafting, etc. They are also building a 250 horse-power engine for a rolling mill in Brockton, Mass., and a second engine for S. D. Warren, Cumberland Mills, Me. They have recently shipped an engine to J. E. Ware, Worcester, Mass.; also to Woolen Mill of N. Sagendorph, E. Brookfield, Mass., and to Atlanta University, Atlanta, Ga.

ELECTRIC LIGHT NEWS

—— Park City and Logan, in Utah, are negotiating for electric-light plants.

—— The Logan (Utah) Power and Light Company has been incorporated with a capital of $5,000. Street lamps will at once be placed. The Thomson-Houston system will be used.

—— The Thomson-Houston Electric Light Company, Newburg, N. Y, have ordered a tubular boiler, and set it with the Jarvis patent furnace, to burn screenings for fuel. They will use the Armington & Sims engines

—— Holmes, Booth & Haydens, Waterbury, Conn., have a patent on an electric-light wire for dynamos and other uses, and are running the portion of their works devoted to its manufacture twenty-four hours per day, and they have also increased their facilities.

—— The electric light was satisfactorily tested Friday night in the Brazil (Ind.) foundry, and on the streets Saturday night. Large crowds were out both nights. From inquiries received as to cost of plant and running expenses, electric light seems to be a fixture.

——A Ball dynamo, with 10-arc lamps, was recently run thirty-six days and nights without a stop, by Jones, Denton & Co., contractors on the new Croton aqueduct, in lighting their tunnel work. This is considered an extraordinary performance by electric-light men.

—— The Jarvis Engineering Co., of Boston, have completed their contract with the Narragansett Electric Light Co, Providence, R. I. The two six foot steel boilers they set with the Jarvis patent setting are furnishing steam for six Armington & Sims engines of 300 H. P. The fuel used is a mixture of screenings and soft coal.

—— A resolution was passed by the San Francisco council authorizing the California Electric Light Company to erect a mast at the intersection of San Bruno avenue and Teneriffe street. The mast is to be 150 feet high and is to bear four electric lights, of 4,000 candle-power each. The cost is to be $5.28 per night, and the company is to look for payment to the surplus fund, if there should be any, at the end of the fiscal year.

—— An engineer in Berlin, Germany, is the inventor of an improved construction of steam-engine, the peculiar feature of which is said to consist in the dead-center point being obviated. In this arrangement a block is secured to the piston rod, the block being provided with a diagonal slot through which the crank-pin passes. The slot has concaved edges facing each other, and is provided with a recess at each end. The slide-valve is attached to a rod provided at the lower ends with tappets, against which the ends of the sliding block strike, thus reciprocating the slide-valve rod. The levers from which the rods are suspended are provided with spring arms for giving the desired degree of expansion.

—— The Jenney E. L. & P. Co., Peoria, are now located in their large new brick station 130x60, and operating 427 arc lights, 210 of which are street lights, including a recent city contract. As is usually the case, they had a hard fight with the gas company, but were ably represented by Mr. Joseph P. Smith, the general manager, who, with other of Peoria's leading business men, compose the company. Mr. Smith has associated himself with the parent company, Fort Wayne, and will prove a valuable addition, it being said that he can get more candle-power from an ordinary arc lamp than any man who gets a hearing before a city council! The installation of a 53-light Jenny plant at Pekin is due Mr. Smith's efforts.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DEC. 1, 1885.

331,275 Steno-telegraph; Angelo Beyerlen, Chicago, Ill.

331,309 Telephone: Wm. C. Lockwood, Brooklyn, assignor to Thomas Wallace, New York, N. Y.

331,327 Electric lamp; Geo. C. Pyle, Cuyahoga Falls, Ohio, assignor to the American Electric Headlight Co., of Indiana.

331,356 Municipal telegraph apparatus; John C. Wilson, Boston, Mass., assignor to the Municipal Signal Co., Portsmouth, N. H.

331,386 Method of straightening needles, wire, etc.; George M. Eames, Bridgeport, Conn.

331,390 Device for operating safe bolt work; Elbert W. Fowler, Chicago, Ill.

331,406 System of temperature regulation; Warren S. Johnson, Whitewater, Wis., assignor to the Johnson Electric Service Co., same place.

331,408 Method of manufacturing electrodes for secondary batteries; Edward Jones, Leeds, County of York, England.

331,407 Secondary battery; Edward Jones, Leeds, County of York, England.

331,463 Electric signaling apparatus; Jacob P Tirrell, Boston, assignor by direct and mesne assignments to James F. Emerson, Wakefield; Geo. O. Carpenter, Boston; and John W. Carter, Newton, Mass.

331,502 Armature for dynamo-electric machines; Chas. T. Jackson, New York, N. Y., assignor to the Hecla Electric Light Co., same place

331,552 Regulator for dynamo electric machines; W. M. Schlesinger, Philadelphia, Pa.

331,585 Contact device for suspended electric conductors; Charles J. VanDepoele, Chicago, Ill.

331,609 Apparatus for electro-plating; Hermann R. Bobsier, New York, N. Y.

331,630 Electric gas-lighter; John Geary, Philadelphia, Pa.

331,650 Electrical indicator; Chester H. Pond; Brooklyn, N. Y.

331,674 Electro-magnetic cut-off for engines; Richard A. Bailey, Providence, R. I.

331,736 Dynamo-electric machine; Hermann Muller, Zurich, assignor to the Werkzeugund Maschinenfabrick Oerlikon, Oerlikon, near Zurich, Switzerland.

BUSINESS NOTICE.

LYNCHBURG, Va., Nov. 9, 1885.

To Whom It May Concern:

We, the undersigned, who constitute the Light Committee of the City Council of Lynchburg, hereby express our deep obligations to Mr. A. Rockoff, electrician, to whose indefatigable labors we owe the successful working of the longest circuit of electric light in the world. When others failed, he came forward and secured all that was desired, making an enviable record both for himself and the company he represents. The plant, which bade fair to be a worthless speculation, has, in his hands, become a success. We regret to hear of his removal from our city to New York, and bear testimony to the excellence of his work and thorough familiarity with his business.

(Signed),

T. A. KRISE, Chairman Light Committee.
J. D. SULLIVAN, Member Light Committee.
PETER J. OTEY, Chairman Financial Committee.
JNO. W. CARROLL, President City Council.
THOS. D. DAVIS, Member Special Council Committee on Electric Light.
N. C. MANSON, JR., Mayor City of Lynchburg.

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MARK.
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Electric Mfg. Company.

EXECUTIVE OFFICES:

Western Union Telegraph Co.'s Building, cor. 23d Street and 5th Avenue,

FACTORY AND WAREROOMS:

163-165 WEST 18th STREET, N. Y.

This Company is engaged in the manufacture of DYNAMO MACHINES and LAMPS, and the construction of ELECTRIC LIGHTING STATIONS for lighting CITIES and TOWNS under the well-known

"AMERICAN SYSTEM"
OF ELECTRIC ARC LIGHTING,

(Wood's Patents.)

SPECIAL ADVANTAGES OF THIS SYSTEM. Completeness, durability, steadiness, quality of light and economy of power. The Wood dynamo-electric generator occupies less space, is lighter, requires less motive power, and costs less than others capable of producing an equal number of lights. There is less firing or flashing of the commutator, and consequently less loss of energy and wearing of the parts from this cause than is the case with other machines. It requires no oiling or other attention than to be kept clean, and its extreme simplicity enables it to be operated with the minimum of skill and attention. The current regulator and signalling apparatus, by which the machine is made to generate the exact current required for any number of lights from one to its full capacity—as they are turned off and on without change of speed or waste of power—is simple, effective, and safe. Its lamps are reliable in operation, the carbon-regulating mechanism being absolute in its control, durable, and unaffected by changes of temperature or weather. They are of ornamental design, and the steadiness and purity of light produced are unequaled at the same expenditure of power.

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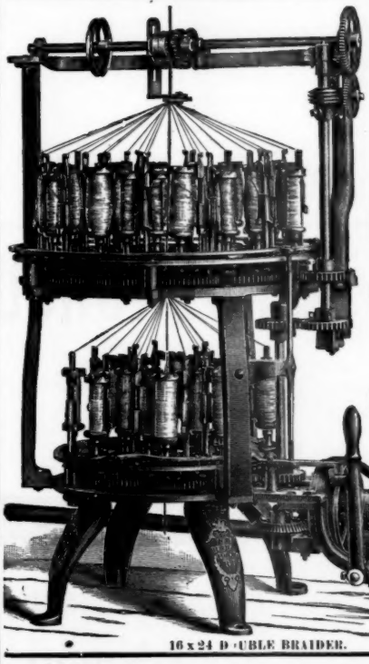

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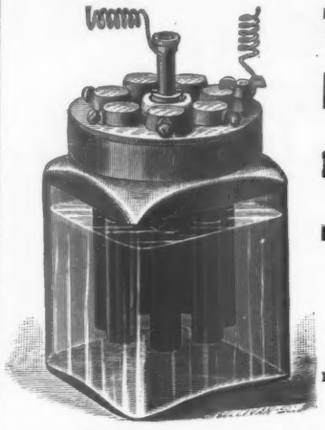

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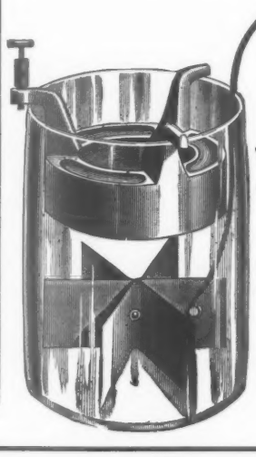

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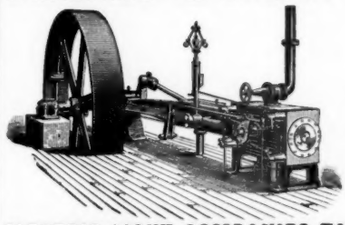
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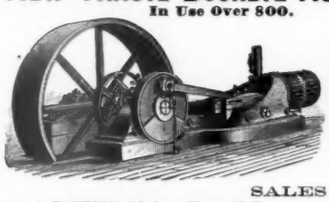
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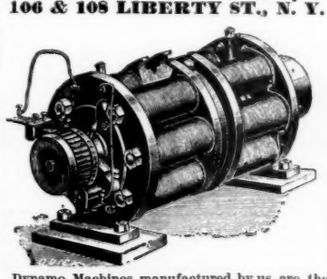
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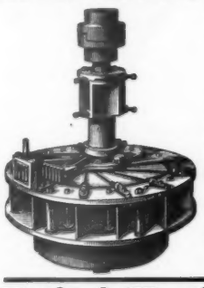
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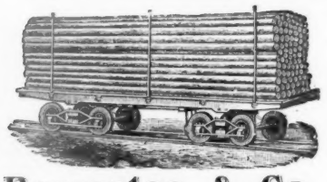

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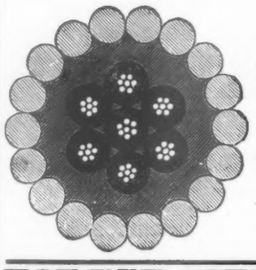

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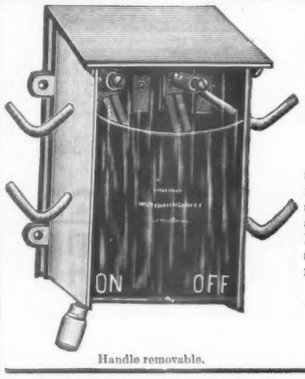

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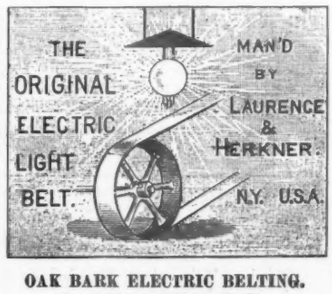

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